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A MISSION FOR THE INFANTRY SERVICE.

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COLONEL EIGHTH INFANTRY.

IT is a deplorable feature of the military establishment of this great and glorious Republic that there is no system looking to progress and advancement such as proper provision for the reward of merit, and the reverse for negative neglect and inefficiency, would bring about. Seniority to the grade of colonel will, when accompanied by good health, carry an officer to that grade with much more certainty than valor or knowledge of his profession. By having an advanced course of duties laid out for it, and officers and men advanced and rewarded in proportion to the amount of work done, the Infantry arm of the U. S. Army could be made to do more for the country than any other branch of the military service.

As the infantry must always constitute the bulk of an army, it must be provided before anything can be hoped for from cavalry or artillery, and any plan which looks to the provision of the necessary amount of infantry is of the first importance. Notwithstanding that cavalry and artillery are auxiliary and can be of little use without proper support from the infantry, the idea is

prevalent in these same auxiliary forces that any one is good enough for infantry, but a man must know something and be somebody to handle and utilize cavalry and artillery. This is due to the fact, no doubt, that these auxiliary arms are required to know nearly everything that is expected of the infantry, and, in addition, everything that distinguishes them from it. It is true that infantry may be very serviceable with a modicum of knowledge, which is readily acquired and not much is expected from it, and no inducement is held out to make it anything more than it is, which is barely sufficient to pass muster. The poorest material the country affords is supplied to make up the rank and file, and the officer has nothing held out to him to stimulate him beyond mediocrity and the perfunctory performance of his duties. Consequently, when the Second Lieutenant gets his commission, he puts aside his books and only takes them up for his entertainment. He has no examination to prepare for and nothing to fear if he is not absolutely negligent. The duties required of both officers and men are of the most elementary character pertaining to the care of themselves and the maintenance of the status of a military force.

These statements refer to the system and consequent results, to which there are many exceptional facts that have their foundation in the various impulses of human nature that sometimes work independent of the causes that usually influence human action. Some officers are content to work hard and faithfully for their own satisfaction, having a pride in doing well, whatever they have to do, indifferent to the absence of any reward. When there has been any real work to do, the Army has always done its duty, and the infantry has performed its lion's share quite as well as any other branch of the Service, showing that if it has anything to do, the infantry will do it. But in these "piping times of Peace" the idea that there is nothing to do prevents anything being done, and a vast deal of time and energy is expended in the merest routine and show of military duty. This routine does not involve as much work in the infantry as in the other arms, and it has for this reason much more leisure which could be utilized advantageously. It is the best use of this leisure time, which could be greatly increased by dispensing with much of the routine work that is of no practical use except to keep the troops occupied, that may be designated as the mission for the infantry.

The first requisite in this direction is the selection of a different material. Instead of going into the large cities to get the able-bodied tramps who have drifted there and found themselves unable to earn a living, we should go into the rural districts and villages and make the selections for the ranks from the youth of the land. They should be taken *pro rata* from all parts of the country for one enlistment, only, as a rule. The best men in the ranks, that we now have, are the young men who have come into the cities to find work, and from lack of experience have been unable to find employment, their value consisting in the fact that they were brought up in the country.

The tendency of the Service is to the establishment of Regimental Posts; field service on the frontier is diminishing, and the leisure of the troops, necessarily, increasing. If the Regimental Posts are constituted as schools of instruction, and the young men, selected as suggested above, placed at these posts to be instructed as far as practicable in every thing pertaining to military art, they could, at the end of their enlistment, be returned to their homes where they would be available as instructors for any emergency requiring such knowledge as they had acquired.

The national strength is in the infantry armies the country would be able to supply. If needed, the first want that will be felt will be instructors to organize the raw levies for the field, and to make them efficient in the shortest possible time would require a vast number. There is, at present, no adequate source of supply for these instructors and this is what should be the mission of the U. S. Infantry. No higher duty could be allotted to it than that of supplying the officers and instructors for the national military forces.

Under a centralized government this would be entirely practicable. Under our government it could not be arbitrarily enforced, but is here presented in the belief that it is entirely feasible. Many will claim that special legislation will be necessary. But, as readily as the schools of Fortress Monroe and Fort Leavenworth have been created by the War Department, every post can, to a greater or less degree, be converted into such a school. Section 1231 Revised Statutes, directs that there shall be a school for enlisted men at every established post.

With young men in the ranks who come in to learn, and with the officers imbued with the importance of the task of instructing them, and with the right kind of encouragement from the War

Department on a generous construction of the foregoing law, there are great possibilities in the plan here suggested.

Of the first importance is the question: Can the right kind of material be obtained? The average strength of the infantry is about 13,500. There are 325 Congressional Districts, and if apportioned by districts, each would have from 40 to 45 representatives to supply. This number could be maintained by furnishing from 9 to 10 recruits annually. Is it beyond credibility to believe that out of a population of from thirty to forty thousand people there could not be obtained annually ten young men for the purposes herein outlined? There are many capable young men, particularly in the country districts, of military ambition, to whom \$13 to \$25 per month, clothed and fed, and the promise of an education for the purpose of becoming an officer in case of war, would be a tempting offer. In many sections, without doubt, it would be necessary to select by competitive examinations. Poor young men, in the rural districts, have no such means to get out into the world held out to them. To procure these young men, it would only be necessary to send an officer, a surgeon and a non-commissioned officer to localities in each district, on due notice, to make the selection and enlist the men. Such young men could be furnished with transportation to depots, and trusted to present themselves on their own recognizance, and the recruiting party could go on to the next place of enlistment. This would not be any more expensive than maintaining recruiting stations in large cities, especially when it is considered that the constitutional tramp, who becomes the professional deserter, forms at least one-third of the material enlisted by the city recruiting officers, making it a very expensive kind of recruiting; in addition to the great detriment, the fact itself is, to the Service.

That this method of recruiting, and the formation and establishment of schools at military posts can be carried out by the War Department, under the direction of the President, without additional legislation, seems sufficiently plausible to justify the experiment. The value of the results of a successful execution of the scheme could not be overestimated. The practical benefits to the people would be sufficiently apparent in the return to his home of the Army graduate with the money he could save and the standing he could attain, to secure the approbation of the people and popularize the Army, which suffers, annually, every

time the Appropriation Bill is considered, from the stigma that attaches to a "Standing Army" in our country.

The most important result, in a military point of view, would be the extensive dissemination of that necessary military information that would be required in the event of a war requiring large armies to be formed. This knowledge would be the result of practical experience in the Regular Service, and would be correct and uniform, and relate to the care and management of troops in actual service, which cannot be said of the military colleges and schools throughout the country, or even of the National Guard.

The direct benefit to the Service would be found in the result that would follow from the young and vigorous material that would make up the rank and file. The alleged aims and purposes of this method of preparing young men for future service would, in itself, be sufficient to give a higher standing to the enlisted man than he at present has, and would induce better material to enter the Service. Such an improvement in the ranks would necessarily involve an improvement among the officers who, generally, under the present unprogressive state of the Service, leave their books as well, when they leave the Academy, and are not required to exert themselves to do any more than the routine duties, or to advance in any way except by the rigid rule of seniority to the grade of Colonel.

All things being equal, seniority is a very good rule, perhaps the best under a republican form of government where political personal influence is liable to, and too often does supersede all other considerations. But it does not guard against the advancement of the incompetent and idle in the same line with the capable and industrious. In every industrial organization, of enterprise and thrift, labor and merit must go hand and hand with seniority. The candidate for promotion must show honest and superior work in addition to length of service. If some method of credit and reward for extra labor and meritorious services, and a corresponding penalty for inefficiency and failure to progress, could be introduced into the Service, it would give it that life and energy it ought to have in this age of progress and advancement. The existing conditions have prevailed in the past, and every war the country has had since its foundation has found the Regular Army in a fossilizing condition, and it required the revivifying influence of War to give it new life and preserve its

existence. It will not require a great many years of Peace, under the existing absence of encouraging elements, to place it in a condition to cause our legislators to take into consideration whether it pays to keep up such an expensive institution that does not yield any better results.

In so limited an article it is not possible to do justice to a subject that should be considered with reference to the entire Army, and is capable of great elaboration. It is hoped that this meagre outline will lead to an extended consideration of the subject.

A FEW WORDS ON HORSE-SHOEING.*

BY BREVET MAJOR GEORGE B. RODNEY, U.S.A.

CAPTAIN FOURTH ARTILLERY.

AS indicated, by the title, what I have to say will be brief. My only object in preparing this paper, is to present to the officers of the Regiment the result of my experience with a subject, well worthy of their careful study and investigation.

While it may be astonishing to some, it is none the less true that many people really believe the foot of the horse to be a solid lump of horn, and that the process of nailing an iron shoe to this horn is a very simple matter. It is a singular fact that a majority of those who use horses, constantly, have never taken the trouble to investigate and understand the construction of the horse's foot, and without doing this, it is impossible to have any idea of what shoeing a horse really means. Now, as a matter of fact, the hoof is a box of horn, surrounding exceedingly delicate and sensitive parts, all of which are intimately connected with and dependent on each other, and essential to the proper growth, power, and durability of the hoof. This horny box consists of three parts, viz., the wall, sole, and frog; each has its work assigned to it by nature, and any interference with either by man, is injurious to the animal.

As I have stated, nailing an iron shoe on this box of horn appears to many to be a very simple matter, whereas it is a very serious one for the horse, even if performed by a skillful artisan, and if they would only understand it, is a matter of consequence to horse owners also.

Intelligent people wonder why it is that one horse can wear out a half-dozen set of legs and they never take pains to inquire into the cause. On the contrary, they close their eyes to facts, and permit smiths and grooms to go on having their own way and work destruction at will. Also, many have given this subject careful examination and study who are positive in opinions that the present system of shoeing is correct, and that to de-

*Read before the Officers of the Garrison at Fort Adams, R. I.

part from it would be inhuman. There are others who have carried their feelings so far as to make use of the laws passed for the prevention of cruelty to animals, and have threatened to prosecute those who worked horses unshod.

Par. 1183 of the Cavalry Tactics having been amended by Order No. 16, c. s. 1888, and this order being the result of the experiments and deliberations of a Board of officers, it is to be assumed that the system adopted is the best. That it is very much superior to the former practice every one will agree, but that it is wrong, in one respect, I shall undertake to show. The principle change made by Order No. 16, is in forbidding the use of the knife for paring away the sole and frog and cutting out the bars of the hoof, a brutal practice that I believe was not always followed, notwithstanding it was authorized. But special authority is given by Order No. 16, to use toe-clips, and to use the knife to cut a groove (for the clip) into the horn at the toe, and it is to this that I object. Now, by cutting a groove in the horn at the toe, the hoof is weakened where it needs the most strength, and even when the sole is not mutilated, as in the former practice, it is my belief that very few blacksmiths are sufficiently skillful and discreet to cut a groove and set a toe-clip without doing some injury to the foot. I certainly would not trust any I have had to do it. To those who are acquainted with the anatomy of the horse's foot, it will be clear that the *linea alba*, corresponding to the quick of the human nail, must be more or less sensitive to the blows of a hammer delivered on the iron clip at the toe, and if the smith happened to go a trifle too deep in cutting out the groove, the pain would be intolerable; and that this frequently happens there is every reason to believe. There is no sense or reason in the toe clip, but, if clips must be used, it should be specially ordered that they are to be set over the horn, and that no cut is to be made with the knife, for the purpose of fitting them flush with the horn. I cannot understand how toe-clips ever came to be authorized, and there can be no doubt that many horses have been permanently maimed by their use.

If horses must be shod, to enable them to perform ordinary duty in the military service, both in garrison and in the field (to which I do not agree), the first thing to decide upon is the size, weight and general character of the shoe, and this should be determined by careful experiments.

Among the many varieties of shoes, the Charlier is the only

one, I know of, that aims to assist nature, not to retard it; but for some reason this shoe has never been popular in this country, while its use in the British Army was limited to a very short season, and the reports were decidedly against its further use. An examination of the bones of the leg and foot of the horse show that, even when at rest, and by simple weight-bearing, a heavy pressure is transmitted through the several bones and tendons directly to the frog. Now, to resist this pressure, the frog must reach the ground; if it does not, the strain on the leg and hoof will severely distress the animal, and, in addition, the very delicate parts that surround the bones, tendons and sensitive frog, will soon become inflamed, owing to the unnatural pressure that is brought upon them. This, in my judgment, is how navicular disease is produced. It can easily be seen how much greater this strain must be when the animal is moving at a trot or a gallop.

Assuming what I have written to be true, it is plain that any form of shoe that prevents the frog from having full play must be a positive injury to the horse. Any full-sized shoe that I am acquainted with (and this includes all regulation shoes), except the Charlier, does prevent the frog from having full play, and consequently is injurious.

The shoes used in the Army and throughout the country are very much too heavy, and why they are made so I cannot understand. It cannot be on account of durability, for a light shoe, if of good material, and properly made, will outlast a heavy one. This is a well-established fact; but I have had such a good exemplification of it in this battery, that I feel justified in giving it in detail. In Battery F., 4th Artillery, there is a horse that had what is known as seedy toe, and the horn of the wall had become so brittle and broken, that it became necessary to shoe him if he was to be used at all. I had a pair of light steel shoes made by the battery blacksmith—these shoes were made one-half inch wide and three-sixteenths of an inch thick, and very light; they were made full-sized, on account of the difficulty of finding sufficient sound horn for the nails, with a one-half or three-quarter shoe. They have been in constant use about four months, and are still good for a month or six weeks' wear. Of course they have been reset several times, and have recently been reset as one-half shoes. That this case may be thoroughly appreciated, I will explain that the horse in question is an off-

wheeler, weight about 1400 pounds, has been standing on broken rock at least five hours every day, and has been exercised at drill from twelve to fifteen hours every week since April. The shoes were made narrow, for the reason that the wall was all that required protection, and thin, in order to give as much play to the frog as possible. I regret very much that I did not weigh these shoes when they were first made, and each time they were reset. I am quite certain that under the same circumstances this horse will wear out at least four pairs of regulation shoes.

As I have before stated, with any full-sized shoe of ordinary weight it is absolutely impossible for the frog to get full play; consequently, in addition to the strain caused by the failure of the frog to act, as provided by nature, a very severe and unnatural pressure is produced by the wall taking up all the shock of placing the foot down. This may appear immaterial, but it is really very important, as the unnatural strain tends to distress and fatigue the animal, and is the real cause of splints. Now, with the unshod horse, or one wearing one-half or three-quarter shoes, the frog, if un mutilated by the knife, takes up its full share of the shock caused by placing the foot down, the hoof expands naturally, and the animal travels with ease, and free from strains or pain. Therefore, I hold that the shoes now in use are too large and heavy, that a one-half or three-quarter shoe, not more than one-half inch wide, nor more than three-sixteenths of an inch thick, is all that the most earnest advocates of shoes should ask for. That horses' hoofs can be put into proper condition to withstand all ordinary wear and tear, without shoes, I am entirely convinced, having experimented sufficiently to convince the most skeptical, and I therefore advocate doing away with shoes altogether. I have had over fifty horses under my charge for the past two years, do not shoe them, and am confident they can march any distance over any kind of roads without the slightest injury to their feet.

When this battery was turned over to me in November, 1886, the horses were unshod, and remained so until the following June. These horses had been exercised at drill on sod, and the ground around the picket line was composed of clay well tramped down. As a matter of course the horn of the hoofs, although soft, did not wear away naturally, but was reduced to proper proportions by the blacksmith. The battery was ordered out on a practice march in June, 1887, and by the time we had marched eighty

miles many (but not all) of the hoofs were so cracked and broken as to require shoes, and most of the horses were shod. I was very much discouraged, and upon our return to the post, did not remove the shoes from many of the fore feet, although I did from some, and removed them from all the hind feet.

The battery went to Chicago in October, 1887, and practically in the same condition, viz., no horses shod behind, and about two-thirds in front. While in Chicago the battery was paraded to receive the President of the United States, and owing to some misunderstanding about the orders, was compelled to move at a trot for over five miles, the route being through the city, and most of the distance over side streets paved with the old-fashioned cobble stones. I looked for a disaster, but was astonished to see the horses did not mind it, and upon our return to camp found all the unshod hoofs in excellent condition, the only injury I could find was where a horse had cast a shoe, and a broken nail had penetrated the sole. This circumstance made a great impression on me, and, after reading what the most prominent advocate of non-shoeing had to say on the subject, concluded to put his plan into operation. Consequently, in the spring of this year (1888), I covered the ground about the picket line to the depth of eight or ten inches with broken rock (the shoes had all been removed immediately upon our return from Chicago in Nov. 1887), and the hoofs began at once to crack and wear away as they had in the field the year before; but as the new horn grew and formed, it gradually became tough and hard, and as well able to resist wear as any iron shoe. I have constantly added to the stone on the picket line until it now resembles the roughest kind of rocky road, and the horses have stood on this rock, on an average, about five hours every day since last March. The test was a severe one but succeeded beyond my expectations, and every horse has splendid hoofs that do not break and crack, but wear away naturally. The frogs have developed, are large and hard, and the soles are so hard that very little impression can be made on them with the rasp, and none at all with the knife. In this connection it will be interesting to some to know that the horn that was first worn away by contact with the rock, wore and cracked very rapidly, and being weak the constant friction separated and disintegrated the horn fibre, in such a manner that the bearing surface of the wall resembled a worn-out scrubbing brush, which was a practical illustration of the fact that the horn laminæ are simply flattened hairs.

It must be remembered that the recuperative power of the horn is very great, and sufficient to supply any demand that may be made upon it; that the supply of blood in the veins and arteries of the leg, which is carried to the hoof to support the waste of horn must perform the work intended for it by nature, and if the waste of horn is checked, circulation is destroyed, inflammation and disease follow.

Now with the shod hoof the horn cannot wear away naturally, but is cut off with the pincers in chunks about once every month, when the animal is reshod; consequently there is always liability to disease and, particularly, thrush.

The fact is, by nailing iron shoes on the horse's hoofs, nature is interfered with in a most vital manner. If we could control nature it would not make very much difference, but as we cannot control nature, it is unquestionably more prudent to keep our hands off, and at the very most to use shoes only when it is shown they are absolutely necessary.

As I have before stated, the horses of Battery F, 4th Artillery, stand to the picket line about five hours every day on a bed of rock. This I estimate to be equal to marching five or six miles a day on a road similar to the picket line, and as the hoofs show no signs of undue wear, I feel safe in claiming that these horses are capable of making any march a light battery might be called upon to make, on any kind of roads, without the use of shoes. A very careful examination has developed the following: *First*, that the hind hoofs wear away more rapidly and uniformly than the fore hoofs. *Second*, that with both fore and hind hoofs, that part in front of the quarter wears more rapidly than from the quarter back.

The first seems to indicate that the propelling force of the hind legs is more severe on the hoofs than the simple weight-bearing of the fore legs. The second, that with his hind legs the animal, in pushing himself along, raises the heel and applies all the pressure to the front part of the hoof, and that the friction caused by raising the fore feet from the ground is probably equal to that caused by placing them down.

All this tends to show that shoes, if necessary at all, are more necessary for the hind than the fore hoofs, and we all know the reverse to be the popular belief.

Not a hoof in this battery has been touched with a rasp or a knife for months, the cutting pincers alone being used, to cut

away slightly when the horn did not appear to wear away naturally, but it has been necessary to resort to this in a few cases only.

Whatever may be thought of my suggestions, so far as they relate to doing away with shoes altogether, of which, of course, there will always be two opinions, there can be no question as to the great benefit to be derived from doing away with shoes while the horses are performing garrison service only. When a horse has been without shoes for a number of months he travels with more freedom, his gaits are more elastic, and, in fact, he is a very different animal from the shod horse. Experiments that I have made relative to the expansion of the horse's hoof, indicate that whatever expansion there may be with the shod hoof is almost entirely due to weakness caused by nail-holes and the operation of preparing the hoof for the shoe; and the only natural expansion is caused by pressure from the frog. If I am correct, and I believe I am, it only proves what I have said before, viz., that any shoe that interferes with the full play of the frog is positively injurious to the animal that wears it.

There is still another advantage to be gained by not shoeing horses. While many will not believe it, the unshod horse is really more sure footed no matter what monstrosities in the shape of calkins may be worn. I do not pretend to assert that the shoes can be removed from a horse that has been shod for months or years, and he can travel bare-footed and sure-footed, at once, without any danger of slipping or possibly injuring his feet materially. But if the shoes are removed and the hoofs given a chance by careful treatment and toughening, as practiced by me, the animal will travel, fearlessly, over any kind of rough and hard roads without injuring his hoofs, and over ice or any kind of slippery road without any fear of slipping. I have tested the matter thoroughly and know I am right. Besides experimenting myself, I have watched horses shod and unshod, with and without calkins, travelling up and down hill, on ice and on paved streets slippery with mud, and the unshod horses had the best of it every time—as a matter of course, the latter were always my own. Calkins are so positively injurious that I cannot understand how any one can favor their use.

The unshod horse must be one whose hoofs have been properly prepared, and one that has the full use of the frog which is of itself a natural calkin, one that never wears smooth, and can be compared to the heel of a new rubber shoe.

A few days since an officer of rank and experience in the Army said to me, after examining my picket line: "You are acting in a manner contrary to all theory, and to the well established practice in the Army, and your horses will soon become stove up" (his exact words). When I asked what he meant by "stove up" he could not tell me, but finally said he meant stiff in the shoulders. Now, could anything be more absurd? Yet I fancy the officer quoted, really believed what he said to be true. The fact is, the practice in the Army and out of it, of standing horses on clay or litter when not in use, and then working them on hard roads, is simply outrageous, and cruel beyond expression; it is equivalent to expecting a hand that has always been carefully gloved to perform the work of that of the laborer. Is a horse any more likely to have stiff shoulders, or any such ailment no matter what it may be called, from standing bare-footed on a bed of hard rock, than from trotting over a turnpike road, with iron shoes nailed to his hoofs. Of course not, and as a matter of fact the chance of injury is one hundred to one in favor of the latter.

When we remember that for years our horses were shod in the most brutal manner, by the express sanction of the authorities, it naturally occurs to some that the conservatism or indifference, or both, that permitted this to go on for so long has not entirely disappeared. Old customs will only be discarded little by little, and no radical change can ever be looked for. Consequently there is little to be hoped for from any official source. I do not pretend to say the blacksmith is the worst enemy of the horse, but he is not far from it, and inflicts more damage to sound, than he does good to unsound hoofs.

Let any one, sufficiently interested, examine the hoofs of the first fifty horses he may meet, and I think he will see sufficient to convince him that shoes are an injury, and if the hoofs of the horses in this battery could be used for comparison I am sure they would carry conviction.

The conclusions I draw from my experience are:

1. The horn of the hoof if permitted to form and wear away as provided by nature, will always accommodate itself to the work required of it, that is, hard horn for hard roads, and soft horn for soft roads.
2. If the hoof is unmutilated by man, the transition from soft to hard horn is rapid, and unless some accident occurs, the

horse cannot possibly suffer any harm or inconvenience therefrom.

3. There is a vast difference in horses, and some hoofs are more difficult to harden than others; but with all it is only a question of time, and, with very few exceptions, the horn hardens rapidly and wears uniformly.

4. That in time the hoof assumes the shape and appearance of that of the wild horse, the frog almost filling the cavity of the under surface, becoming very hard, and widening very much at the heels.

5. With a hoof that has been unshod for several years, expansion is all on the upper part of the hoof, and greatest near the coronet. This may not be very important, but, if true, is very perplexing.

6. That in the ordinary practice of preparing the hoof for the shoe, the former is weakened where nature has made it strong, and nailing an iron shoe to the hoof does not make up for the loss of strength caused by rasping and cutting.

7. That shoes are a positive injury, and, no matter what may be said in their favor, ruin thousands of horses, every year, that would otherwise be healthy and useful.

FORT SNELLING, MINN., Dec. 30, 1888.

THE PRACTICAL TRAINING OF FIELD BATTERIES.*

BY LIEUTENANT C. B. SATTERLEE, ADJUTANT,

THIRD ARTILLERY.

WHEN in 1869, in pursuance of a plan of the Secretary of War, an attempt was made to establish a school for field artillery at Fort Riley, Kansas, the importance of the arm and the necessity for its practical instruction were fully recognized. That need had long been felt, but notwithstanding the earnest suggestions and endeavors of some in authority, nothing of tangible good was attained in the nature of a school. It was hoped that a suitable school would be instituted to accomplish the following ends:

1. To establish uniformity of practice in the field artillery service.
2. To study the gun, matériel and ammunition; to learn their purposes and uses.
3. To study and train the artillery horse.
4. To determine the effects to be produced by field artillery in war.
5. To acquaint those under instruction with the principal rules governing the employment of this arm in the field.

None will question the pressing necessity of such an institution; all must admit that the school would have been of great benefit to the artillery. The Light Artillery School of 1869 was short-lived. Auspiciously created by the assembling of four field batteries, its ill-starred career closed by the conversion of these troops into cavalry. Two years was too brief a period for perfecting a system of training for this important arm. Yet the objects in view were worthy and still exist. They will control in the rise and progress of the new school sought to be started on the site of the old one, and with the issue of the latest model of a field piece the school will find new problems to deal with.

It is consoling and encouraging to reflect that he who projected the school at Fort Riley is now where the influence of his

*Read before the Officers' Lyceum, 3d Artillery, Washington Barracks, D. C., January 3d, 1889.

energy and zeal may make itself felt. He has already given evidence of his concern for this branch of the Service, and has exhibited a warm interest in the heavy artillery.

Officers of artillery have come to realize that something must be done, even if the weapons of '61 are used, with a personnel and a quota of horses and guns which principles of economy reduce below the war strength. They feel that in default of a school where batteries might be organized into the artillery brigade and be taught the tactics of field artillery, the battery should be made a school of itself.

In spite of the unsatisfactory condition of affairs, some officers have done all for the artillery that their abilities and opportunities and the orders of higher authority would permit. They have not been deterred by that time-worn argument or excuse, that until properly horsed, manned and provided with the newest weapons, nothing need be done. This is but a makeshift to escape responsibility, and to defeat unintentionally the objects for which a battery is mounted and maintained. The light battery is a school of lesser capacity, 'tis true, than the one in contemplation, but it moves in the same direction. The pupils are fewer, but their instruction embraces the same curriculum; the aim is the same, viz.: the ultimate efficiency and the placing of the battery on a footing as nearly resembling that of War as money and circumstances will permit. The field batteries must be brought up to a proper standard of usefulness—that standard which will warrant their being maintained, and that proficiency which shows the laborer to be worthy of his hire. Means and opportunities are available for fruitful and valuable work with what, for my purpose, may be called the artillery unit—the light battery—stationed singly, as all our field batteries are at the present. Every battery may not enjoy the advantage of service at a light artillery school. The battery must, therefore, depend upon itself. In default of the larger school it becomes its imperative duty to constitute itself a school—and a school in the strictest sense of the word. It should serve under true colors, and be a reality rather than a name. Its reputation and career are wholly within its own keeping. Field batteries are expensive organizations, and to maintain them the principle has been acknowledged that it should be “on the footing of the highest attainable efficiency consistent with economy.” To this end there must be no lagging, no drifting with the tide; there must be work.

LIGHT BATTERY DUTY AND ITS PRACTICAL NATURE.

Real light battery duty is no easy service; it is arduous and exacting. But the conditions should be cheerfully accepted. This duty can be made interesting as well as instructive, or it can be monotonous and proportionately burdensome. It is of a strictly *practical* nature, and it is the practical course that is essential in all army service. Let one read all the books in Christendom, and become a veritable wiseacre, but what will all his learning avail him if he has no practice? It is knowledge well applied that tells. "Knowledge and application are two very different things; the first depends on study, the second on constant practice." Glance over the drill-book if you will and reflect on the rules prescribed. You will find the *practical* the burden of their significance. They call for the practice of what we learn; they imply an attention to details which alone can insure that confidence in officer, man and horse necessary for efficient service. The officer who by experience and practice has acquired a full comprehension of his duties, under all circumstances, is he who can act with confidence and as a master, and he alone. Constant practice, even in the minutest details of one's profession, can alone guarantee that confidence and that desirable presence of mind under trying emergencies which confidence begets. To discipline and instruct the man; to know the horse; to use intelligently the weapon furnished, learn its powers and possibilities, and the purposes of the ammunition; and to practice in all things, is the business of the light battery. The necessary guides for duty and training of the batteries can be found within the covers of the Army Regulations and the so-called Artillery Tactics, but these authorities must be read not literally, but understandingly, and construed intelligently. To summarize the objects set forth in the drill-book, I venture to make three general headings, viz.:

1. The training of the *personnel*; the training and care of the horse; inuring *all* to the burdens and hardships of service.
2. Acquainting the *personnel* with such details as precede their duties on the firing ground.
3. Acquiring the ability to fulfil the distinctive role of artillery, which the much-quoted Prince (Hohenlohe) sets down as 1st., 2d and 3d, *To hit*. These objects are possible of accomplishment. If they require elucidation, the will to do—that

mainspring of success in any undertaking—will afford the light and will also devise the means.

THEORETICAL.

While I lay special stress on the element—*practical*—in service, I am not unmindful of the need of theoretical study; but I do contend that practical teaching is the most potent influence in bringing a battery up to that efficiency in which the more abstract scientific principles can find useful application. The theoretical work of officers must generally, if not at all times, depend upon themselves. The captain, as commander and instructor, cannot govern the professional reading of his subalterns save in a small degree. As a rule, pride, self-interest and devotion to duty must be an officer's incentive. The provision for the recitation of the non-commissioned officers is wise, and should receive the closest attention. It should be carried on with a special view to their practical work in the stable, on the drill-ground and in the field. They should know their drill and be informed as to the *raison d'être* of all matters pertaining to battery service which may come within their sphere of action. They must be more than mere machines or workers by the rule of thumb.

THE COURSE OF PRACTICE.

In pursuing any course of practice in a light battery there should be a well-defined system, where instruction shall be made gradual and progressive. The best school is that which is systematic. A plan for practice should be adopted in conformity to the requirements of general service. When once laid out and found practicable and productive of good, it should be rigidly adhered to. To drill simply because a drill is ordered; to fire away ammunition merely for the sake of getting rid of it; to do anything in a perfunctory manner, is not fulfilling the mission of the school. The battery must rise above the questionable distinction of being ornamental. All its performances must be in the direction of usefulness. The point I try to make is this: begin at the beginning; proceed "slowly but thoroughly," and in every drill or exercise let some worthy motive be promoted. A light battery commander of to-day enjoys a singular advantage for adopting and carrying into execution a system of instruction. Unlike his predecessors before the Civil War, his freedom of action, with few exceptions, is especially guaranteed and

guarded. In former times the field batteries were handicapped. Now the battery is not included in the general fatigue of the post, performs no post-guard duty proper, and is seldom interfered with in any system of drill or instruction. It is related that at one time the field batteries were garrisoned with usually from three to five foot organizations, and each officer of the latter either commanded or performed duty with the Field Artillery. Foot captains are said to have alternated with mounted captains in command. How impracticable a scheme!

A light battery commander now possesses a prerogative as to the training of his battery which is denied the commander of a regiment as regards its instruction. The colonel may never come in contact with some of the organizations composing his regiment; his acquaintance with their condition and service is acquired through quarterly reports of instruction.* Here is independence in battery commanders affording an opportunity for making a reputation not elsewhere found in the line. It is their own fault if they do not take advantage of it. But while battery commanders may and should pursue regular and well considered courses of practice, these should be made uniform and consistent. Individuality should have play but not to such an extent as will compromise the general aims governing all. In the interest of uniformity, I advocate the assignment of a capable officer at division, or preferably at army headquarters, whose duties shall be those of supervision and inspection and whose rank and recognized ability will give weight to his recommendations.

THE TRAINING OF THE PERSONNEL.

In adverting to this important feature of a soldier's development the following, from a recent translation from the German, of the drill regulations for infantry is quoted:† "Military training aims at the education and preparation of officers and men for service in war. All exercises must be considered from the standpoint of war. The heaviest demands which war sets up are the strictest discipline and order and the fullest control of all the powers. To so train the troops in these qualities that they may become second nature is the chief purpose of all exercises on the drill ground and in the field." While all this is applied to the infantryman the motives underlying the training of the artilleryman are

* Orders issued since the writing of this paper, require yearly inspections by regimental commanders.

† By Captain James Chester, 3d Artillery.

no less freighted with consequence. The soldier, as a soldier, must be able to stand exertion, and be capable of enduring fatigue. He must in the first place have a soldier's build and set-up, acquired through long hours of drill. This position must, using the translator's expression, be second nature. Let him be hardened to his appropriate burdens. This is the aim, primarily, of the preliminary exercises—the squad drill; secondly, of subsequent training. Adequate muscular development and activity cannot be acquired by dismounted and mounted drills alone; nor will the mere riding of a horse in his exercise insure the attainment of these qualities. Rigid practice of the rules laid down in the drill-book, for moulding the man into shape and forcing him into physical condition for arduous work, must be regularly observed. This is within the province—am I wrong in saying it is the duty—of every battery commander. But I would not confine the man's training exclusively to the methods therein prescribed; more can be done. It is desirable to strengthen and harden the muscles; it is equally essential that they be active. Running and leaping are beneficial; likewise boxing and wrestling; besides these latter exercises develop the man's equanimity, an indispensable quality in a well disciplined soldier. The Regulations of 1881 provide that the company fund may be disbursed "for such exercise and amusement as may be, in the judgment of the company commander, for the benefit or comfort of the majority of the enlisted men of the company."* Would it not be well to add:—and as may be demanded by the interests of the Service? Expenditures might properly be made from this fund for the purchase of Indian clubs, foils, boxing-gloves, etc. Many crude appliances, such as horizontal bars and vaulting horses, may, however, be constructed without cost; a little ingenuity is necessary. When once procured or made, they should be regarded as other than play-things. The men should be required to practice, and be encouraged in field sports. A system of gymnastic instruction may be devised and carried on without interfering with the other duties of the battery, particularly during the winter season when the men most require regular exercise.

THE CARE AND TREATMENT OF THE HORSE.

This subject is one of great importance and from the references made to it and the injunctions regarding it as found in the

* Orders issued since the writing of this paper, prohibit such disbursements.

drill-book it is evident that the author so believed. It is certainly a subject for study and observation by those charged with the efficiency of a light battery. The inspection of horses by officers of the quartermaster department may nullify the rule set forth that the captain should if practicable inspect his horses before purchase; but it cannot relieve artillery officers of the duty of learning what the artillery service requires in the shape of horse-flesh. Every officer should be able to tell the age of the animal and have an insight into the impositions usually practiced by horse-dealers.

The prime element of usefulness in horse artillery is mobility; in a minor degree is mobility essential in a field battery. While we may not demand so great a development of this quality in the latter, its serviceability, *per se*, in contradistinction to the real power of artillery which is its effect of fire, resides in the horse. He is the motive power of a battery. Know the horse then as we know the gun and ammunition. An acquaintance with equine diseases is surely indispensable. To keep the animal in good condition we must know how to care for and treat him. Reliance on the veterinary sergeant with his one or two assistants, is not sufficient. Upon their judgment and skill too much dependence is placed. Is the sergeant invulnerable to sickness or injury? Can his presence always be assured? Are his assistants infallible? The battery commander should qualify himself for these duties, and his subalterns and non-commissioned officers should be qualified to support him. Moreover, in a less restricted sense no officer, be he battery commander or the wearer of the straight sword, is aware how soon a knowledge of this subject may be demanded of him. Referring to the drill-book we find that "the captain is responsible that his officers have a thorough knowledge of the structure, and power, and endurance of horses." "He requires every officer to be familiar with the rules for their management under all circumstances, to understand in detail, the method of shoeing them, and to be able to treat all ordinary cases of injury or disease." "To this end he prescribes such recitations and practical instruction as may be necessary. In the field, or on the march, an ignorant or careless commander will have many broken down and unserviceable animals, while those of other commands, performing the same service, but judiciously handled, remain in good condition." The sequel to this is plain. There should be thorough practical information on the subject. How can this be acquired, and briefly, what should be done? I believe, a feasible and

an agreeable method would be to require the officers to read up and inform themselves by such means as they may possess, prepare papers to be read and discussed by the officers of the battery and subsequently read to the non-commissioned officers who should be given more than passing attention. True, for the latter, recitations may be had but the wider information of their officers might well be afforded them. Each officer and non-commissioned officer should thoroughly know the internal and external anatomy of the horse, the principal bones and muscles. In addition it is essential that they be familiar with what ailments and injuries the horse is liable to and how to detect them. They must be able to prescribe in all ordinary cases. The more usual diseases might be enumerated on the fingers' ends and their treatment appears to be simple; so with injuries. It will be seldom that a professional veterinary need be called if the proper instruction be given.

DISEASES AND INJURIES.*

1. Cold in the head—catarrh.
2. Cold in the chest—bronchitis—cough.
3. Sore throat.
4. Lampass.
5. Colic.
6. Thrush.
7. Punctured wounds and gathered nails.
8. Sprains—strains—lameness.
9. Injuries of foot and lower leg.
10. Wind-galls and sore back. Abrasions.

It is thought that a practical knowledge of the above might be very readily acquired. Ample authorities are available, such as Williams and Tellor, supplied each battery. Moreover, the horse is present for careful study. I maintain that the captain should require each of his subalterns, and the non-commissioned officers of the section to which the disabled animal belongs, to be present in every case of sickness and injury. It is but carrying out the provisions of the drill-book; it is but the performance of a duty to the subaltern and to the Government. They may then study in a practical way and learn the trouble and its treatment. Herein lies the gist of the instruction. *This*

* This list was compiled by the Veterinary Sergeant of Light Battery C, 3d Artillery, who mentioned them as the more common in his experience.

practice should be insisted on. It is a preparation for emergencies more readily imagined than described. Suppose the case where a platoon or section (section as used in the Artillery Tactics) is detached and the horse doctor does not accompany it; here practical knowledge of the veterinary's trade might become very useful.

STABLE MANAGEMENT.

The care and stable management of the horse; his watering, feeding and grooming, be it in garrison or on the march, constitute one of the most important duties of a light artillery officer. It is only by careful attention on the part of all concerned, to these particulars, that the animals can be kept in serviceable condition. Every enlisted man must be given instruction. The duties are best comprehended by practical experience. Let the subalterns of a battery at all times be accorded a meaning responsibility in these matters.

SHOEING OF HORSES.

Besides that care and general attention which horses should receive—for they cannot perform their own ablutions, clean their feet, nor can they put on their shoes—the adjusting of the foot-gear must be understood. The drill-book lays down certain rules governing these methods which, however, recent orders materially change. Farriers are said to be obstinate individuals and tenacious of their views; can they always be relied upon to pursue the practices prescribed, or by those responsible, thought to be the best? The proper methods must not only be known, but enforced. To be carried out, a supervision by some one in authority is necessary; and to make that supervision effective, an accurate knowledge of the whys and wherefores is indispensable. One who never sees a shoe put on cannot be regarded as a capable judge or instructor. It may be said that very few non-commissioned officers know when a horse is properly shod, or what changes should at times be made. The captain should see that they are practically informed. To the end that the subalterns may become familiar with the details of shoeing, they should be required to superintend it and be held to a strict accountability therefor.

THE TRAINING OF THE HORSE.

To train a horse for service requires more than his exercise. The character of the work demanded of him appeals not alone to

his power to pull a dead weight, or his strength to carry his rider ; it must develop otherwise dormant faculties. To train a horse involves patience, good judgment and plenty of drill—drill, however, of the right kind. New animals must first be made tractable ; forbearance in their treatment here becomes a virtue, yet how frequently do we see recruits put in charge ; men who have still to learn what should be done ; men possessed of more tongue and temper than coolness and gentleness. Ill treat a horse, use him harshly, and he resents it and may confirm habits which prudent handling would have obviated or corrected. " Persistent kindness often reclaims vicious animals. Having made him steady and obedient, his further training follows naturally. The primal lessons must be under the eye of an officer. To walk, to trot and gallop, to change the gaits and direction, to obey the wishes of the rider as communicated by the legs, feet and reins, and, not least in importance, to be indifferent to firing, are features which any well-trained artillery horse must count among his accomplishments. The same care and patience which were exercised in making him tractable are essential here.

THE RIDING-SCHOOL.

Where but in the riding-school or *Ménage*, as the English term it, is the place for his instruction ? I believe the more frequent resort to it the better, not alone for the horse, but the school affords excellent, I would say *the* means for teaching the men to ride. The omission is a debatable question, with the arguments almost wholly on one side. Every battery has or should have its drill-ground where a riding-school can be laid out. But a few accessories are requisite to adapt it for the purposes aimed at, viz. :

1. Horsemanship.
2. The training of the horse.

The instruction of the man and animal will go on simultaneously ; it must be conducted according to a progressive system. The soldier is taught the position of the trooper mounted, and acquires a proper seat ; he learns to ride bareback, with saddle and watering bridle, to regain his seat from the ground while the horse is moving at different gaits ; and the use of the spurs. How frequently a horse is made to stall by the improper use of the spur. It is but a goad when improperly used. A rude hurdle, a slight ditch only, are necessary as means to teach the ani-

mal to jump; a few leather heads, posts and rings may be employed in teaching the use of the sabre; but all are essential in giving the men stability on the horse's back, and in causing them to govern their mounts. To cut a head on the ground or on a post, to point a ring, requires skill on the part of the rider, but they should be taught. By all this the horse is trained. No man can ride with confidence save by practice. He must learn to control his horse before participating in a battery drill, where noise and confusion prevail, and where, so to speak, he must forget himself. Will any one deny that practice in the riding-school, whenever the ground and weather permit, is more interesting, instructive and beneficial than a "stretch-out" on the road? Such bad habits, as are in the latter so readily acquired, on a monotonous trip along a dusty road, are checked; the lounging and slovenly attitudes, annoying to the horse, so usually seen, give way to an "attention" drill; and at the same time the horse has had his exercise. True, there will be but little sight-seeing, but it can be dispensed with.

ROAD EXERCISE WITH CARRIAGES AND PRACTICE MARCHES.

With reference to horse exercise without carriages, it is believed that it should be confined to the riding-school, with few exceptions. The reasons given above are thought sufficient argument. The object of any exercise is ostensibly to keep a horse in workable condition. The expression, the horse is "fresh," or "soft," is heard at times. I doubt whether its full significance is appreciated. "Fresh," or "soft," may be applied to new horses; it may also apply to those which are daily exercised. The meaning is apparent when it is intimated that the animal is soft until he is able to take the road or field, and under service conditions perform what work of a light or heavy character he may be put to. Until he can stand, and without shortly becoming disabled or weakened, undertake marches, and answer the calls made upon him, he is not properly trained or disciplined. The horse, like the man, must be inured to his normal burdens or draught; he must acquire this ability by a well-considered series of exercises. The idea is advanced that a soldier should stand a portion of his guard in knapsack or heavy marching order. Does the suggestion find application with the horse or his rider? To haul carriages over paved streets or macadamized roads is good in so far as it goes—there is, in fact, this advantage, that empty wagons

make more noise than filled ones—but it does not accomplish all that is desired. In this exercise the question of the weight pulled, the nature of the roads passed over, and the condition of the weather, is full of import. Pertinent hereto, the following quotation from the instructions of 1850 for field artillery, is digestible food for thought in these days: "The battery should frequently take out a day's forage, secured and arranged as for service, the detachments being in marching order, their blankets, etc., properly fixed; it should be made to go over all sorts of ground, up and down steep slopes and across ditches. The intrenching tools should occasionally be taken off (which presumes that they are taken along), and used in filling up holes and making ramps to enable the carriages to pass over difficult ground." In road practice the carriages are not all weighted to their campaign allowance, the draught of each horse being considered. The ammunition is never carried: many of the prescribed implements and equipments are left behind; frequently the spare wheel is missing; and, above all, the routes travelled do not present the difficulties which must be encountered in the field. There seems to be one advantage in carrying the implements, and occasionally dragging out the ammunition from its long imprisonment in storehouse or magazine. If no other, it will serve the purpose of informing those concerned where they may be found, and how packed and carried.

With field batteries, unlike horse batteries, a provision is made for carrying the cannoneers on the chests or axle seats. It is readily seen that by this practice nothing is gained as regards mobility; on the contrary much of their power is sacrificed in trying to fulfill that necessary condition. Directly the moment arrives when there is most need that the cannoneers should be mounted they must dismount. When the battery leaves the road to take a position—and it should be done rapidly—it may be required to make ascents or traverse cultivated and soft ground; then their continuance on the seats must seriously impair any rapid execution. The mounting of the cannoneers, save when prescribed, should be the exception rather than the rule. Granted that great effort may be demanded of them in the service of the guns, but as compared with the infantry soldier, who walks, they have the advantage. The artilleryman has his knapsack carried. The infantryman must "tote his own skilet." The cannoneers must become accustomed to the fatigue of foot travel

and learn that to sit on the chests is a privilege rather than a right. In long marches the drivers should occasionally be dismounted and walk; great relief is thus afforded the horses.

The battery must be in readiness at all times to take the field and fulfill its mission as to marches. This is the culmination of its preliminary training and systematic exercise. It is the attainment of a quality only second in importance to the real element of usefulness, its fire. In addition to the practice marches contemplated in orders recently issued and which will be productive of untold good, it is thought that shorter trips, but subserving similar purposes, should be indulged in. A battery may at intervals be sent out from its post and directed to proceed over certain routes. It will transport such, forage, etc., as the occasion may require. The battery need not return the same day; a bivouac over night is instructive even if it be on the roadside. The idea is to keep it constantly active and alive and to prepare men and horses for their legitimate and proper field duties. Practice marches, of long or short duration, must be made schools of instruction for the personnel. It is not enough to lumber along over a turnpike and make no observations of the surrounding country. An itinerary of each day's travel will be kept by the officers and non-commissioned officers in turn. The rate of march per hour and the condition of the horses under varying circumstances of road and weather will be accurately noted. No better opportunity is afforded for the instruction of officers and men in the selection of proper positions for a battery in action, in throwing up hasty cover and in judging ranges. It is but stimulating the actual practice of the battery in a campaign. In connection with marches, the matter of speed trials and tests of time and pace, as advocated and conducted by artillery officers abroad, suggests itself. If recent writers are read correctly, the principle is asserted that artillery should arrive rapidly on the field of battle. It must be able to do so after a day's march. The necessity for frequent practice marches is now apparent.

The average march for field artillery on good roads is fixed in the drill-book as from 15 to 20 miles per day; and with rare exceptions the walk is the invariable gait. A greater distance than 25 miles, on good roads, may be made but only after the horses are inured to their work. It is related that certain batteries from Saarbruck (1870), marched 20 miles in $4\frac{1}{2}$ hours; they had previously covered $14\frac{1}{2}$ miles. The condition of the roads

passed over is not stated. Another instance is given where an English battery, on good level roads, made 27 miles in 5 hours—in one of the hours 7 miles—and the horses came in in good condition. Captain Thring, R. A., translates from the French as follows: "Numerous examples from the War of 1870 also show, that a battery which wishes to open fire at the right moment should be able to cover 15 kilometres ($9\frac{1}{4}$ miles) in an hour and a quarter. Very few of our batteries are able to move so rapidly; on service all would do so, but they would arrive exhausted, and the vigor of their fire would suffer in consequence. Should they, when in action, receive the order to advance another two kilometres, they would have to do it with teams that were tired and blown, and consequently this advance under the enemy's fire could not be done at the rapid pace which is essential to its due performance. We must not therefore count on the excitement of the moment to overcome these difficulties, and to make great efforts; we must prepare in time of peace, and with this object every battery should be trained to make long marches, to cover considerable distances at a trot before coming into action and then, after firing, to advance at a rapid pace to a fresh position at some distance." The foregoing examples of power and endurance are mentioned to show to what stages of training and development the horse may and should be brought. Time is a vital consideration in a campaign. He who first gets his guns into action obtains an advantage—an advantage which has decided the fate of armies—on the Kriegsspiel board. Battery commanders should know the capabilities of their horses; their power to cover distances without exhaustion and over all kinds of roads, and at different gaits. Or, having a road described to him, the commander should be able to say with reasonable accuracy in what time he could cover it. It is needless to remark how invaluable precise information on the subject might be to the commander of an army, or how the want of it might effect his plans and operations. I do not presume to fix upon any proper distance to be passed over in a day or an hour by a field battery during its peace marches. I do believe it can and should be made capable of doing more than the drill-book prescribes. All this can be accomplished by practice and trials, gradually and systematically carried on. This should be a feature of all practice marches.

THE DRILLS OF THE BATTERY.

These embrace the schools of the driver, team, section,

platoon, and lastly that of the battery. Note the idea of progress implied in the arrangement. In battery instruction it should be followed. Before the season for out-of-doors exercises begins a well-digested plan should be formulated. And let whatsoever is done be done with a purpose in view. The several drills should be under the command of respective chiefs and superintended by the officers. It is meant that a chief of section should be permitted to drill his section. Greater individual confidence is thereby assured. One drill naturally succeeds another. By making the section accurate in its evolutions, the platoon more readily and quickly arrives at proficiency, and, in turn, that of the battery is enhanced. The "about," the "reverse," and the "countermarch" must be accurately taught the units first. It might be a novel sight to witness a platoon commander drilling his subdivision in preliminary exercises. But will the wisdom or propriety of the procedure be doubted. Although not all applicable on the field of battle or in campaign, the movements laid down in the drill-book should be practiced. The requirements, if fulfilled, are conducive to facility of manœuvre and, moreover, serve in instructing the men in riding. The subalterns of a battery are supposed to be efficient in their drills before the expiration of their tour of duty with the battery. How can they become so unless they are given opportunities for commanding? What confidence can they acquire without experience? I hold that they should at intervals be called upon to drill the battery.

HARNESS DRILL. CARE OF HARNESS AND CARRIAGES.

That the carriages and harness may be kept in clean and serviceable condition, some one must superintend and inspect. The subalterns should be given an accountability therefor, and be held to it at all times. The officers and men must thoroughly know the parts of the harness and their purposes. They cannot pay too much attention to its proper fit. The harness drill should be conducted under the eye of the officers, who will see that it is so adjusted that the horse will pull to the best advantage and with the least discomfiture to himself. Fresh horses cannot always be introduced into a team, or be put into strange gear immediately upon arrival. Patience and gentle handling must be had and practice carried on daily.

HASTY FORTIFICATIONS.

It is indispensable that officers and men should be taught the

principles of hasty cover. Numerous examples might be cited of the employment of hasty intrenchments for artillery, but their necessity as a protection to this arm on the battle-field is everywhere conceded. Being requisite, something must be known as to their character and construction. Under the fire of infantry, even at considerable ranges, cover must be had and it must be *rapidly thrown up*. But a few moments are necessary to place a battery *hors de combat*. Hence the importance of practical information. The subject should be taught the non-commissioned officers by recitations while in garrison, and practically to officers and men in the field. Recitations might well consist in laying out on paper the forms most generally used. It will not be the first time it has been done in battery instruction. No more favorable occasion presents itself for practical work of this character than during practice marches, even if the ground is afterwards leveled.

RECONNAISSANCE.

Another duty with which officers and non-commissioned officers should become perfectly familiar is that of reconnaissance. The ability to correctly read a map should be possessed not only by the officers of the battery, but also by the non-commissioned officers. Likewise they should be capable of making an intelligent representation of the country they may pass over; such as its topography, the character of the roads, nature of the fields, position of woods and streams; and, moreover, be able to properly indicate positions for artillery. This is peculiarly a subject where practice must be had to guarantee the acquirement of proficiency. Instruct the non-commissioned officers in garrison in the use of the compass; then mount and send them on to the roads for the purpose of compiling data.

FIRING PRACTICE.

Unlike the cavalry and infantry which may use the sabre and the bayonet upon the enemy, the artillery depends for its effect wholly upon its fire. Accuracy and rapidity of fire is therefore the ultimate purpose of a battery. Skill in target practice does not consist in simply striking a clearly seen objective. The character of the target demands the employment of its appropriate projectile, that best suited for the special purpose; moreover the gunners, upon whom reliance must be placed in war in the laying of the guns, must needs be made capable. All exact intelligent

and persistent practice, and practice in certain features which need not be deferred until the battery arrives on the firing ground. Firing practice may be classified under two heads, viz :

1. Range Practice.
2. War Practice.

The first is but a preliminary stage where the range being known and all conditions accurately ascertained beforehand, the battery is instructed and its firing improved while in the possession of determinate factors. It is target practice proper. It includes duties which can to advantage be carried on in garrison and subsequently in the field. It could not be used in war, although it is a preparation therefor, for the enemy will not signal their distance from the battery nor will they communicate the results of each shot.

RANGE PRACTICE.

Of the several matters which should receive attention in range practice, the following are suggested ;

1. Standing gun drill.
2. Systematic practice in pointing and laying the gun.
3. A study of the projectiles used and their respective purposes ; and instruction in the manipulation of fuzes.
4. The making out of range tables for each gun and its several projectiles. The power of different powders must be given careful consideration.
5. Consistent target practice.

The cannoneers must thoroughly know their drill and the duties of their several posts. Constant practice here conduces to facility and accuracy of execution of all details. These duties might well become second nature in order that, when men are excited and in action, better fire discipline and regulation of fire may be more surely obtained. This contemplates that the gunners are familiar with their own duties. Besides rapidity of manœuvre is essential ; time is a consideration.

The accurate laying of the gun is the prime element towards good shooting. Herein lies the special training of the gunners. Errors in laying the piece are many and not every gunner any more than every infantry soldier will become, so to speak, a sharp-shooter. These men must be selected with a view to their aptitude. This quality can never be ascertained except by practice. While a majority of gunners may learn to point a piece accurately, but a small per cent. will do so with rapidity. Rapidity is

necessary, not only as pertaining to the quick delivery of shots upon coming into action, but to overcome difficulties attending the fire of several guns when prompt aim must be taken during intervals between clouds of smoke. Not every gunner has the same keenness of vision, nor will all men standing behind a piece sight alike. These peculiarities or personal equations can be determined and corrected. Gunners must be perfectly familiar with the sights and learn, as it were by instinct, to use them.

Attention is invited to the practice recommended for teaching the infantryman to sight his musket as found in Blunt's "Rifle Firing." The tripod, sand-bag and white screen and disk are used, and each man is required to repeat his aiming with the rifle stationary. His errors are marked and pointed out to him. This can certainly be done with the field-piece, and the inaccuracies of each gunner ascertained. Another method for this instruction is that contained in General Orders No. 108, series of 1888, from the Headquarters of the Army. It is the use of the machine gun, and a short-range instructional and deviation target. It is unnecessary to describe the targets or how the practice is conducted, as the order is doubtless known to all. The above are mentioned as *available* means for teaching the gunners, and such men as are capable of learning, the use of the sights, the meaning of the terms, coarse and fine sight, and in determining for each man at what distance from the rear sight both sights and the object can be most distinctly seen. The principle of the graduation of the sights, of the laying of the gun on uneven ground, with the axle inclined, will be taught the non-commissioned officers.

"The range and accurate performances of a particular gun at experimental practice cannot be depended upon to give certain indications of what another gun of the same nature will do under service conditions which are not so favorable."* Each piece has its equation, which must be solved. Whereas, a range table may be made at trial firing, it may not answer for practice. Would it not be well to work out range tables for each gun, firing the different projectiles, and with such kinds of powder as may be supplied?

It is necessary that the several projectiles and the special purposes of their ammunition should be well understood. No shot should be fired without a knowledge of the object for which

* Mackinlay's "Text-Book of Gunnery."

it was designed. *The effectiveness of fire is the thing desired.* An accurate hit may be made with a shell, and yet, upon this same target, shrapnel would have produced a more decided and better result. Shell produces its effect by the power of penetration and explosion: shrapnel by the dispersion of its bullets. Hence, to use the latter with the intent of knocking out material would be but throwing it away. The fact that we have had to do so little with shrapnel is a powerful argument for a study of its character and use. The efficient employment of fuzes, be they time or percussion, involves careful practice. This is peculiarly the case with shrapnel and a time fuze, where a practical knowledge of the principles of ballistics as pertaining to the flight of the dispersed bullets is important. The increased velocity of rifled projectiles permits shrapnel fire at longer ranges than formerly, but at the same time it requires the use of very accurate time fuzes. To produce the greatest effect such a fuze would be employed, that the burst may take place at a proper point in front of the target. With increased velocity greater comparative spaces are passed over in succeeding moments of time, and to burst the projectile at precisely the right time, the cutting of the fuze must be to a nicety. Too much attention cannot be given to this feature of the instruction of the officers and gunners. Every kind of projectile and fuze which may be used should be kept on hand where they can be examined and explained to the men. Dummies are better than none at all, provided their manipulation and application are made clear. With the increased allowance for each field-piece (3 inch rifle), and the encouragement which may be hoped will be given target practice, comprehensive instruction may be expected.* It should be conducted with a special view to the training of the officers and men, and every shot should be made to tell in this instruction. The ranges are known, and in this practice do not change. Targets representing infantry behind intrenchments, in extended order, in mass and column; representing artillery and cavalry, could with small cost be constructed and placed at suitable ranges. The effect of fire on each will be accurately noted, for on this rests the efficient working of the gun. The influence of wind and other causes of deviation must be carefully observed. The appropriate use of the projectiles and the proper employment of the fuze now present themselves for thoughtful consid-

* General Orders No. 108, series 1888, A. G. O.

eration. The methods in detail to be pursued in this practice will readily suggest themselves. The gunners must become as familiar with their guns as the sharpshooter is with his rifle.

WAR PRACTICE.

This is defined to be practice at unknown ranges, over hilly or undulating ground, and at moving targets. It is, in fine, a practice most resembling war, and accustoms officers and men to the reality of war more than anything else. The greatest accuracy here cannot be expected, but in the measure of its attainment rests the efficiency of the battery. Preliminary to it, and an essential in its success, is the instruction of officers and men in judging distances. The battery commander must look through their eyes on many occasions, and they should be made reliable reporters. An accurate and convenient range finder should be supplied each battery. Practice with it may be conducted in conjunction with the judging distance drill, that is, the estimation of distances by the eye. Of course firing may be corrected by noting the effect of trial shots with percussion fuzes, but this involves delay and an expenditure of ammunition without material results; and besides, "it is difficult to do at long ranges, where the effects of fire cannot be readily distinguished, even with the aid of a field-glass." In the estimation of distances, and in judging the point of fall or burst of projectiles, let the officers and men approach as nearly as possible to the English range finder or observer, a certain old artilleryman, who it is said, with the aid of the eye and experience alone, reports very accurately the results of shots in terms such as: "5 yards right and 15 hover." In war practice the targets will represent the several objectives which would present themselves on the battlefield, but they will be so placed as not to be seen from the battery until the firing begins. Judgment in determining ranges is now appealed to in a manner very like that of War. The importance of accuracy is apparent. Likewise, the employment of appropriate projectiles, having in view the effectiveness of fire, presents itself for consideration. The accuracy of each particular shot will not be determined directly it is fired, the results not being signalled. The average result of the practice, as ascertained from the number of shots and hits, will be taken as the standard of proficiency. The targets should be light, so as to be easily handled. They may be placed on the ground, and at the

proper time raised into view by means of small ropes led off to places of shelter. In addition, moving targets may be introduced in order to simulate the movement of a battery, a body of troops, or a charge of cavalry. For this purpose roller targets will be had. All may be constructed at a trifling cost, the only expense of any moment being the drag rope which is used in pulling the roller over the range. It may not be possible to screen the roller target from view at all times; in fact, it is not essential that it should be covered, as it may be considered as visible only when moving between certain well-defined points agreed upon beforehand. Conveniences will be readily improvised for dragging it in various directions over the range. Its speed will be given by men or horses. During war practice the battery must be required to change its position, and come into action and open fire either at the same targets or, preferably, others.

CONCLUSION.

In the preceding remarks I have sought to invite attention to the necessity for the practical training of our field batteries and in a measure point out with my limited experience as a guide, some of the features thought to constitute their instruction. I draw attention to the subject rather than propose any scheme or system for practice which will naturally suggest itself. No battery can be regarded as *efficient*—it is undeserving of the distinction—until it can take the field at short notice and without exhaustion to man and beast perform its proper and peculiar rôle. Two matters must always be kept in view: *The ability to march and manœuvre; the ability to hit.* Both are important, but the second vitally so. The battery which possesses the first without the second is but ornamental. The road to proficiency is by stages, each of which demands constant practice. The battery which would achieve success must be governed by a spirit of the *initiative*, that spirit which using what is obtainable, and without waiting for specific instructions, does all that is possible; what is needed is a willingness and a determination to do; these supplied, the way follows.

COMPARATIVE TABLE OF THE RELATIVE VALUES OF FIELD ARTILLERY GUNS.

COMPILED BY FIRST LIEUT. A. D. SCHENCK, U. S. A.,

SECOND ARTILLERY.

PREFACE.

IT is not to be understood that an absolute mathematical value can be determined for a gun, especially as to its value in the field during War. But the method here followed presents a fair idea of the relative values of two or more guns. Moreover, it illustrates, forcibly, the relative harmony and proportions obtained in the designing and construction, and demonstrates with great exactness the success obtained in combining the various and often conflicting elements which enter into the problem of the construction of field artillery *matériel*.

It is quite evident that the same uniform value of 100 as a maximum should not be assigned to each element in the table; but it would be no easy matter to assign proper values, as possibly no two artillerists will agree as to what they should be. But as each element or group of similar elements are first considered individually, and in turn, a uniform value for all will present very perfectly the degree of harmony and success in design secured. Besides, any element which, from preponderating influence, ought to be assigned a greater value, as, for d^2/w , for instance—really secures the desired end, from the fact that this factor exercises a controlling influence upon all others relating to ballistics, whether for good or evil.

In like manner the weight of the *wheel* influences very largely, either directly or indirectly, nearly every element relating to weight or mobility, and it may be laid down as an axiom, that to insure the maximum of success in such combination and construction necessitates the minimum of values for these two factors at the start, which practical experience has demonstrated to be possible, and these to a very large extent must dominate other less important conditions.

Experience has demonstrated conclusively, that without good

values for these factors, good results, either as to ballistic power or mobility, are impossible, no matter what the other conditions may be.

The reasons for some of the "inversions" in this table may not at first be apparent, especially to the gun constructor. But from the point of view and consideration of the artillerist they are no doubt correct. He measures the value of a gun by its effects at the target at battle ranges and not at the muzzle; or of the different carriages by the weight of gun or of ammunition they will carry in war service within the proper limits as to the power of his horses, and handicaps all conditions which directly affect him, his horses, men or *matériel* adversely, and rewards those which affect his enemy in the same manner. For instance, the heavier the powder charge the better as a general rule, but whether this be true or not depends entirely upon the results obtained in battle. When due consideration has been given to the weight to be transported, smoke upon the battle field, recoil, strain upon the carriage, weight of projectile fired and the number and size of the bullets it contains, or the bursting charge of a shell, remaining velocity and energy, etc., etc., for the 3.3 pound charge for the German 3".46 gun as compared with like results assured with the 3.75 pounds for the U. S. 3".2 gun, there can be no question as to which favors the artillerymen to the greatest extent. That engine is the better, whether a ballistic one or otherwise, which assures the greatest amount of useful power with the least consumption of fuel.

The "proposed" gun results simply from the compiler trying to combine and harmonize the good points presented by any of those mentioned, to the exclusion, so far as possible, of the bad or undesirable elements. The wheels are based upon the Russian, and upon the conceded extraordinary excellence of their manufacture in this country, with the tread properly regulated to the load imposed when moving over cultivated ground. The lightest wheel is amply strong for service in firing, for either of these guns, simply because the conditions have been made such as not to destroy the wheels or carriage by excessive recoil; but a wheel which can be reduced to the minimum of weight so far as respects sufficient strength, is out of the question for the heavier guns, simply because the weights imposed are such that a considerable increase of tread is necessary in order to keep the traction within limits when moving off the roads, always the battle condition, and con-

sequently the controlling one. This increased tread necessitates increased weight, which insures more strength than is actually required when proper conditions of design and construction are adhered to. The bill of iron for a metal limber of the same general form and equal strength as the old U. S. limber, gives 292 pounds as the maximum weight for the limber-body.

With a modern form of brake for the gun-carriage—which any competent American wagon-maker can readily devise when a proper charge of powder is adhered to—to relieve the wheel-horse, the rigid splinter bar, absolutely indispensable to insure powers of quick and certain control of the carriage by the driver, with spring tug-links to relieve the shoulders of the horse, and the pintle as close as possible to the axle, thus reducing to the minimum the lever-arm for “thrashing” the pole around in every direction; then will be preserved to the artilleryman, all of the virtues sought to be secured by the rigid splinter bar, position of the pintle, and even lighter weight than for the old limber, and its comparison with any other limber, modern, foreign or otherwise, reveals the undoubted fact that this old limber still remains the superior of any for war purposes, and must unquestionably be held the champion war limber of the world, and the same holds equally good for the old caisson. Yet for either, it has become possible to readily secure equal or greater strength with, at the same time a considerable reduction in weight, this even after adding a modern brake to the caisson.

To determine, beyond question of doubt, the fact as to whether great improvement be possible upon any gun now in service as illustrated by this table, and especially upon our new 3".2 gun (model 1886), it is not necessary to evolve a suppositious gun or limber. Give the American artilleryman the option of “limbering-up” to the present German 3".46 gun, and the demonstration becomes conclusive with approved *matériel* already in actual service. Without the round of “case”—which is not carried upon the carriage in our Service,—the carriage for the above-named foreign gun weighs 1160 pounds; “limber-up” to it we should have:

	Calibre.	3".46	3".2 (model 1886)
Gun.....		990 lbs.	804 lbs.
Carriage with implements, complete.....		1160 "	1304 "
Limber and equipments, complete, old U. S.		962 "	New, 1072 "
Ammunition.....		26 rounds, 559 "	30 rounds, 503 "
Totals.....		3671 "	3683 "

The old 3" Rifle equipped as a light field gun with seats and 72 rounds, weighed.....			3684 lbs.
Projectile	17.93 lbs.	13 "	
Weight of projectiles in limber.....	467 "	390 "	
Bullets in shrapnel, per pound.....	35 "	32 "	
Bullets in shrapnel	270 "	107 "	
Bullets in limber, (suppposing all shrapnel)..	7020 "	3210 "	
Bullets' effective range.....	4500 yards.	4500 yds.	

Comment upon this showing is entirely unnecessary, except possibly to state that this same combination, entered in the table beside the existing guns and in place of the "proposed" light field gun, will show conclusively, when both power and mobility have been duly considered, that it would secure for the U. S. Artillery a very greatly superior gun to any now in service no matter where, and so vastly superior to the new 3".2 gun that there is not even room for reasonable comparison.

FORT WADSWORTH, N. Y. H., *March 5, 1889.*



ERRATA.* (See Table.)

BATTLE CONDITIONS, LIGHT FIELD GUNS. Under "Energy—French," for 61.7 read 61.6.

RELATIVE VALUES, ETC., LIGHT FIELD GUNS. Under "W't of proj.-lbs.—German," for 98 read 99.

HEAVY FIELD GUNS. Under "d 2/w—English, M. L.," for 9.640 read 0.640.

HORSE ART'Y GUNS, (Concluded.) Under "Load per inch of Tire, Limber, French," for 396 read 296. Under "Carriage, Weight, Austrian," for 1.227 read 1.027. Under "W't of proj, per Gun, U. S. 3" .2, Model 1886," for 1.038 read 1.638, and (?) after 136 under "Axle."

LIGHT FIELD GUNS, (Concluded.) Under "Wheel—tread Austrian," for 3 76 read 2.76.

RELATIVE VALUES, ETC., LIGHT FIELD GUNS. "U. S., 3" .2, Model 1886. To fire 1 lb. of proj.," for 66 read 63.

* These corrections may be transferred with the pen.



(Comparative Table of the Relative Values of Field Artillery Guns.)

HORSE

Nation.	Cal.	Round shot.	Length.		Weight of Projectile.			Charge.		d ³ /w	I. V.	B	
			Total.	Rifling.	Lbs.	Round Shot.	Sectional density.	Lbs.	Per ct. of Proj.			In shrapnel.	Per lb.
" Proposed "†..	3.0	3.584	86.00	72.00	13.50	3.73	1.90	2.75	20.4	0.666	1476	216	40
Russian.....	3.43	5.308	66.90	46.20	15.35	2.89	1.66	3.16	20.6	0.724	1350	165	41
German.....	3.09	3.915	82.67	60.24	12.16	3.16	1.61	2.75	22.6	0.785	1525	123	27
English, M. L.	3.0	3.584	92.00	70.80	13.25	3.69	1.89	3.13	23.5	0.678	1595	116	34
Austrian.....	2.95	3.460	76.77	56.04	10.51	3.04	1.54	2.09	19.8	0.837	1385	105	35
French.....	3.15	3.983	89.76	66.48	12.54	3.12	1.60	3.3	26.3	0.791	1608	93	23
U. S. 3".2.....	3.20	4.353	90.70	71.53	13.00	2.98	1.62	3.75	28.8	0.787	1750	107	32

RELATIVE VALUES,

Max. Values...	100	100	100**	100	100	100	100	100*	100*	100*	100*	100	100*
" Proposed "†..	87	67	78	100	88	100	100	76	97	100	92	100	57
Russian.....	100	100	100	64	100	77	87	65	96	92	100	76	56
German.....	90	54	81	84	79	85	84	76	87	85	88	57	85
English, M. L.	87	67	73	98	86	99	99	68	84	98	84	54	67
Austrian.....	85	65	87	80	69	82	80	100	100	79	98	50	65
French.....	92	55	74	92	80	83	83	64	88	84	84	43	100
U. S. 3".2.....	93	82	73	99	84	80	84	56	70	91	77	50	72

LIGHT

" Proposed "†..	3.4	5.215	87.10	70.00	18.00	3.45	1.98	3.45	19.1	0.642	1460	310	40	40
German.....	3.46	5.494	82.68	58.56	17.93	3.28	1.90	3.3	18.3	0.667	1456	270	35	33
French.....	3.54	5.880	94.08	64.56	18.04	3.07	1.83	4.18	23.2	0.694	1492	97	21	1
Austrian.....	3.43	5.308	70.44	57.48	15.74	2.96	1.70	3.3	20.9	0.747	1471	165	35	2
Russian.....	3.43	5.308	82.80	63.00	15.35	2.89	1.66	3.16	20.6	0.724	1450	165	41	2
English, M. L.	3.6	6.183	78.00	58.04	17.9	2.89	1.79	3.0	16.8	0.766	1355	128	28	1
Italian.....	3.43	5.308	82.68	59.78	14.74	2.77	1.60	3.19	21.6	0.797	1489	177	28	2
U. S. 3".2.....	3.2	4.353	90.70	71.53	13.0	2.98	1.62	3.75	28.8	0.787	1750	107	32	10

RELATIVE VALUES

" Proposed "†..	94	84	81	98	100	100	100	87	88	100	92	100	52
German.....	96	88	85	82	98	95	96	91	91	96	93	90	60
French.....	98	95	75	90	100	89	93	72	72	92	91	30	100
Austrian.....	95	85	100	80	87	86	85	91	81	86	92	53	60
Russian.....	95	85	85	89	86	84	83	95	80	88	93	53	51
English, M. L.	100	100	90	82	99	84	90	100	100	84	100	41	75
Italian.....	95	85	85	84	82	80	80	94	73	80	92	54	75
U. S. 3".2.....	89	70	77	100	72	87	81	80	62	81	77	34	65

HEAVY

" Proposed "†..	3.8	7.281	99.29	76.00	27.5	3.77	2.42	5.94	21.6	0.535	1445	519	44	69
German.....	3.78	7.166	98.43	66.34	26.4	3.68	2.33	5.72	21.6	0.541	1427	300	27	36
Russian.....	4.19	9.767	82.60	60.96	27.5	2.81	2.00	4.01	14.5	0.635	1200	340	41	45
French.....	3.74	6.930	98.40	68.35	24.0	3.46	2.18	4.62	19.2	0.582	1453	204	21	26
English, M. L.	4.0	8.493	98.00	79.20	25.0	2.94	2.00	4.0	16.0	0.640	1350	180	18	18

RELATIVE VALUES, &

" Proposed "†..	92	78	82	96	100	100	100	69	68	100	83	100	41	1
German.....	90	73	83	83	96	98	96	70	68	99	85	58	66	
Russian.....	100	100	100	77	100	75	82	100	100	84	100	65	40	
French.....	89	71	84	86	87	92	90	86	75	92	82	39	90	
English, M. L.	95	87	84	100	91	77	82	100	70	83	89	34	100	

† By the Compiler.

HORSE ARTILLERY GUNS

(Lieut. Schenck in Journal Military Service)

Bullets.				Pattern. 2		Remaining Velocity.		Energy.						Recoil.			Per Ton of W		
rap.	Per lb.	Total. 1	Effective Range.	Perpen- dicular	Parallel	4,500 yds.	Loss	Of 4 charge.	Muzzle.	Loss.	4,500 ⁶ yds.	Loss	Force of	Veloc- ity of	Work of	Wheel.	Axle.	B	
						YDS.	FT.	YDS.	F. S.	%	F. T.	F. T.	%	F. T.	%	F. S.	TONS.	LBS.	LBS.
5	40	34,560	4,500	34	251	710 ⁸	52	292	204	30	47	77	76	13.34	2.2	70	56	2	
6	41	27,225	3,300	25	237	615	55	306	192	36	40	79	83	13.8	2.4	63	56	2	
9	27	18,942	4,500	22	280	675	56	285	194	32	38	80	62	11.5	1.8	83	51	3	
0	34	16,472	4,500	21	260	737	54	272	228	16	50	78	80	11.2	2.0	126	49	2	
5	35	15,960	3,300	20	200	593	57	223	139	38	26	81	44	10.4	1.29	144	76	3	
8	23	14,880	4,500	19	286	648	60	334	223	34	37	84	76	12.1	2.2	103	45	1	
7	32	13,482	4,500	20	187	675	63	370	276	26	41	85	100	14.0	2.9	70	47	2	

VALUES, &c. OF HORSE ARTILLERY GUNS.

	100*	100	100	100	100	100	100*	100*	100	100*	100	100*	100*	100*	100*	100*	100*	100*
57	100	100	100	88	96	100	76	74	53	94	100	58	77	59	90	80		
56	80	73	73	83	83	94	72	70	44	80	97	53	75	53	100	80		
85	55	100	65	99	92	93	78	69	50	76	96	71	90	71	76	88		
67	48	100	62	91	100	95	82	83	100	100	99	55	93	64	50	92		
65	46	73	59	70	81	92	100	50	42	52	95	100	100	100	44	59		
100	43	100	56	100	88	87	66	81	47	74	91	58	86	59	60	100		
72	40	100	59	65	92	82	60	100	61	82	90	44	74	47	90	96		

LIGHT FIELD GUNS.

40	46,500	4,500	48	189	727	51	355	266	25	66.0	74	90	13.1	2.71	64	55	21
35	34,020	4,500	43	201	722	51	340	264	23	64.7	75	100	14.3	3.01	64	50	17
21	13,386	4,500	27	300	702	53	421	276	34	61.6	78	93	12.4	2.80	88	54	19
35	21,120	3,800	35	180	649	56	353	236	33	46.0	81	42	12.2	1.26	160	123	42
41	27,225	3,500	35	128	636	56	331	224	32	42.6	81	78	12.7	2.35	64	66	26
28	18,176	4,100	31	180	638	53	326	228	30	50.0	78	55	9.0	1.64	153	95	38
28	23,020	4,200	37	173	652	56	335	227	32	43.5	80	67	10.8	2.00	97	81	34
32	16,585	4,500	29	187	675	68	370	276	26	41.2	85	97	14.0	2.90	70	47	23

VALUES, &c. OF LIGHT FIELD GUNS.

52	100	100	100	63	100	100	92	96	92	100	100	47	70	46	100	85	8
60	73	100	90	67	99	100	96	95	100	98	99	42	63	42	100	94	100
100	30	100	56	100	97	96	79	100	69	93	95	45	72	45	72	87	9
60	45	84	73	60	89	91	92	85	70	70	91	100	73	100	40	38	4
51	59	77	73	43	88	91	98	81	71	64	91	54	71	54	100	71	6
75	39	91	63	60	88	96	100	83	77	76	95	76	100	77	41	49	45
75	49	94	77	58	90	91	97	82	71	65	92	62	83	63	66	58	5
65	35	100	60	62	93	81	88	100	90	63	85	43	64	43	91	100	75

HEAVY FIELD GUNS.

44	65,394	4,500	56	263	797	45	532	399	25	122	70	100	17.1	5.74	35	31	111
27	39,000	4,500	47	300	783	46	545	387	29	113	71	99	18.1	5.73	33	30	98
41	42,840	4,000	51	135	675	44	435	275	37	88	68	64	14.3	3.66	41	49	215
21	26,112	4,500	40	320	758	48	457	350	23	96	73	65	13.0	3.74	70	47	152
18	18,000	4,500	37	312	691	49	435	312	28	83	73	50	10.6	2.87	90	60	244

VALUES, &c. OF HEAVY FIELD GUNS.

41	100	100	100	82	100	98	82	100	92	100	97	50	62	63	94	97	88
66	60	100	84	94	98	94	80	97	80	93	95	50	58	63	100	100	100
40	65	88	91	42	85	100	100	69	62	72	100	78	74	100	80	61	46
90	40	100	71	100	96	91	95	87	100	80	93	77	81	98	47	64	64
100	27	100	66	97	87	89	100	78	83	68	93	100	100	97	37	50	40

Relative Values of Field Artillery Guns.)

HORSE ARTILLERY GUNS

Calib. and Shot.	Length.		Weight of Projectile.			Charge.		d ² /w	I. V.	Bullets.				Pattern. ³		Rem. Vel.
	Total.	Rifling.	Lbs.	Round Shot.	Sectional density.	Lbs.	Per ct. of Proj.			In shrap- nel.	Per lb.	Total. ¹	Effective Range.	Perpen- dicular	Parallel	4,500 yds.
Calib.	IN.	IN.	LBS.		LBS.	LBS.	%		F. S.	No.	No.	No.	YDS.	FT.	YDS.	F. S.
584	86.00	72.00	13.50	3.73	1.90	2.75	20.4	0.666	1476	216	40	34,560	4,500	34	251	710
308	66.90	46.20	15.35	2.89	1.66	3.16	20.6	0.724	1350	165	41	27,225	3,300	25	237	615
915	82.67	60.24	12.16	3.16	1.61	2.75	22.6	0.785	1525	123	27	18,942	4,500	22	280	675
584	92.00	70.80	13.25	3.69	1.89	3.13	23.5	0.678	1595	116	34	16,472	4,500	21	260	737
460	76.77	56.04	10.51	3.04	1.54	2.09	19.8	0.837	1385	105	35	15,960	3,300	20	200	593
983	89.76	66.48	12.54	3.12	1.60	3.3	26.3	0.791	1608	93	23	14,880	4,500	19	286	648
353	90.70	71.53	13.00	2.98	1.62	3.75	28.8	0.787	1750	107	32	13,482	4,500	20	187	675

RELATIVE VALUES, &c. OF HORSE ARTILLERY GUNS

100	100 ^{3*}	100	100	100	100	100 ²	100 ²	100 ²	100 ²	100	100 ²	100	100	100	100	100
67	78	100	88	100	100	76	97	100	92	100	57	100	100	100	88	96
100	100	64	100	77	87	65	96	92	100	76	56	80	73	73	83	83
54	81	84	79	85	84	76	87	85	88	57	85	55	100	65	99	92
67	73	95	86	99	99	68	84	98	84	54	67	48	100	62	91	100
65	87	80	69	82	80	100	100	79	98	50	65	46	73	59	70	81
55	74	92	80	83	83	64	88	84	84	43	100	43	100	56	100	88
82	73	99	84	80	84	56	70	91	77	50	72	40	100	59	65	92

LIGHT FIELD GUNS.

215	87.10	70.00	18.00	3.45	1.98	3.45	19.1	0.642	1460	310	40	46,500	4,500	48	189	727
494	82.68	58.56	17.93	3.28	1.90	3.3	18.3	0.667	1456	270	35	34,020	4,500	43	201	722
880	94.08	64.56	18.04	3.07	1.83	4.18	23.2	0.694	1492	97	21	13,386	4,500	27	300	702
308	70.44	57.48	15.74	2.96	1.70	3.3	20.9	0.747	1471	165	35	21,120	3,800	35	180	649
308	82.80	63.00	15.35	2.89	1.66	3.16	20.6	0.724	1450	165	41	27,225	3,500	35	128	636
183	78.00	58.04	17.9	2.89	1.79	3.0	16.8	0.766	1355	128	28	18,176	4,100	31	180	638
308	82.68	59.78	14.74	2.77	1.60	3.19	21.6	0.797	1489	177	28	23,020	4,200	37	173	652
353	90.70	71.53	13.0	2.98	1.62	3.75	28.8	0.787	1750	107	32	16,585	4,500	29	187	675

RELATIVE VALUES, &c. OF LIGHT FIELD GUNS.

84	81	98	100	100	100	87	88	100	92	100	52	100	100	100	63	100
88	85	82	98	95	96	91	91	96	93	90	60	73	100	90	67	99
95	75	90	100	89	93	72	72	92	91	30	100	30	100	56	100	97
95	100	80	87	86	85	91	81	86	92	53	60	45	84	73	60	89
95	85	89	86	84	83	95	80	88	93	53	51	59	77	73	43	88
90	90	82	99	84	90	100	100	84	100	41	75	39	91	63	60	88
95	85	84	82	80	80	94	73	80	92	54	75	49	94	77	58	90
70	77	100	72	87	81	80	62	81	77	34	65	35	100	60	62	93

HEAVY FIELD GUNS.

881	99.29	76.00	27.5	3.77	2.42	5.94	21.6	0.535	1445	519	44	65,394	4,500	56	263	797
166	98.43	66.34	26.4	3.68	2.33	5.72	21.6	0.541	1427	300	27	39,000	4,500	47	300	783
767	82.60	60.96	27.5	2.81	2.00	4.01	14.5	0.635	1200	340	41	42,840	4,000	51	135	675
930	98.40	68.35	24.0	3.46	2.18	4.62	19.2	0.582	1453	204	21	26,112	4,500	40	320	758
493	98.00	79.20	25.0	2.94	2.00	4.0	16.0	0.640	1350	180	18	18,000	4,500	37	312	691

RELATIVE VALUES, &c. OF HEAVY FIELD GUNS.

78	82	96	100	100	100	69	68	100	83	100	41	100	100	100	82	100
73	83	96	96	98	96	70	68	99	85	58	66	60	100	84	94	98
90	100	77	100	75	82	100	100	84	100	65	40	65	88	91	42	85
71	84	86	87	92	90	86	75	92	82	39	90	40	100	71	100	96
77	84	100	91	77	82	100	70	83	89	34	100	27	100	66	97	87

Para. 3	Remaining Velocity.			Energy.						Recoil.			Per Ton of Work of Recoil. 7				
	4,500 yds.	Loss		Of 4 charge.	Muzzle.	Loss.	4,500 yds.	Loss		Force of	Velocity of	Work of	Wheel.	Axle.	Body.	Carriage.	Gun & Carriage.
YDS.	F. S.	%	F. T.	F. T.	%	F. T.	%		F. S.	TONS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
251	710 ⁸	52	292	204	30	47	77	76	13.34	2.2	70	56	252	455	814		
237	615	55	306	192	36	40	79	83	13.8	2.4	65	56	209	403	751		
280	675	56	285	194	32	38	80	62	11.5	1.8	83	51	304	610	1,093		
260	737	54	272	228	16	50	78	80	11.2	2.0	126	49	289	678	1,151		
200	593	57	223	139	38	26	81	44	10.4	1.29	144	76	381	790	1,150		
286	648	60	334	223	34	37	84	76	12.1	2.2	103	45	192	530	955		
187	675	63	370	276	26	41	85	100	14.0	2.9	70	47	239	428	710		

ILLERY GUNS.

100	100	100*	100*	100	100*	100	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*
88	96	100	76	74	53	94	100	58	77	59	90	80	76	90	87	
83	83	94	72	70	44	80	97	53	75	53	100	80	91	100	94	
99	92	93	78	60	50	76	96	71	90	71	76	88	63	66	64	
91	100	95	82	83	100	100	99	55	93	64	50	92	66	59	61	
70	81	92	100	50	42	52	95	100	100	100	44	59	50	51	61	
100	88	87	66	81	47	74	91	58	86	59	60	100	100	79	74	
65	92	82	60	100	61	82	90	44	74	47	90	96	80	92	100	

189	727	51	355	266	25	66.0	74	90	13.1	2.71	64	55	211	420	816	
201	722	51	340	264	23	64.7	75	100	14.3	3.01	64	50	175	387	723	
300	702	53	421	276	34	61.6	78	93	12.4	2.80	88	54	196	534	951	
180	649	56	353	236	33	46.0	81	42	12.2	1.26	160	123	425	962	1,756	
128	636	56	331	224	32	42.6	81	78	12.7	2.35	64	66	267	458	900	
180	638	53	326	228	30	50.0	78	55	9.0	1.64	153	95	388	967	1,786	
173	652	56	335	227	32	43.5	80	67	10.8	2.00	97	81	345	678	1,234	
187	675	68	370	276	26	41.2	85	97	14.0	2.90	70	47	239	448	724	

ELD GUNS.

63	100	100	92	96	92	100	100	47	70	46	100	85	83	92	89	
67	99	100	96	95	100	98	99	42	63	42	100	94	100	100	100	
100	97	96	79	100	69	93	95	45	72	45	72	87	90	72	76	
60	89	91	92	85	70	70	91	100	73	100	40	38	41	40	41	
43	88	91	98	81	71	64	91	54	71	54	100	71	65	84	78	
60	88	96	100	83	77	76	95	76	100	77	41	49	45	40	40	
58	90	91	97	82	71	65	92	62	83	63	66	58	51	57	59	
62	93	81	88	100	90	63	85	43	64	43	91	100	73	86	100	

263	797	45	532	399	25	122	70	100	17.1	5.74	35	31	111	212	519	
300	783	46	545	387	29	113	71	99	18.1	5.73	33	30	98	201	440	
135	675	44	435	275	37	88	68	64	14.3	3.66	41	49	215	347	722	
320	758	48	457	350	23	96	73	65	13.0	3.74	70	47	152	439	853	
312	691	49	435	312	28	83	73	50	10.6	2.87	90	60	244	585	1,284	

D GUNS.

82	100	98	82	100	92	100	97	50	62	63	94	97	88	95	85	
94	98	94	80	97	80	93	95	50	58	63	100	100	100	100	100	
42	85	100	100	60	62	72	100	78	74	100	80	61	46	60	61	
100	96	91	95	87	100	80	93	77	81	98	47	64	64	46	51	
97	87	89	100	78	83	68	93	100	100	97	37	50	40	34	34	

NATION.	Pressure.		Strain on Carriage.	Per Ton of Strain. ¹⁰					4,500 yards.				Burat- ing charge.	Furni- ture.
	Max.	Bottom bore.		Wheel.	Axle.	Body.	Car- riage.	Gun & Car- riage.	Vel- ocity.	Energy	Burnt'g charge.	Bullets.		
"Proposed"†.....	LBS.	TONS.	TONS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	OZ.	11
Russian	33,600	106	60	2.57	2.07	9.2	16.7	29.8	2.52	38.1	2,864	8.28	10.	Wedge
German	30,000	124	69	2.18	1.93	7.3	14.0	27.5	2.93	45.0	4,095	10.9	7.1	"
English, M. L.	33,000	110	62	2.42	1.99	8.8	17.7	31.7	2.91	51.3	3,960	16.0	7.8	"
Austrian	37,000	116	70	3.60	1.40	8.3	19.2	32.9	3.11	46.0	3,714	20.0	10.	M. L.
French	30,000	91	55	3.38	1.40	7.0	18.7	30.6	2.86	64.8	6,316	16.0	4.4	Wedge
U. S., 3".2.....	35,000	122	66	2.40	1.50	6.4	17.6	31.9	3.24	56.8	4,200	22.6	8.1	Screw
	37,000	132	80	2.55	1.70	8.7	15.5	26.2	3.11	51.0	6,363	20.0	5.28	"

Maximum Values...	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100	
"Proposed"†.....	90	94	91	84	70	70	84	88	100	100	100	100	100	Safe
Russian	100	73	79	100	72	88	100	95	86	84	70	75	71	Safe
German	91	82	89	90	71	72	80	82	86	74	71	52	78	Safe
English, M. L.	81	79	79	61	100	77	73	80	81	83	77	41	100	Safe
Austrian	100	100	100	64	100	91	75	85	88	59	45	52	44	Safe
French	91	80	86	61	93	100	80	82	79	69	68	32	81	(?)
U. S., 3".2.....	81	70	69	87	82	73	90	100	81	74	43	41	53	(?)

"Proposed"†.....	32,480	130	66.0	2.64	2.39	8.6	17.2	33.4	3.17	34.8	3,685	7.10	10.	Wedge
German	32,480	136	74.6	2.56	2.02	7.0	15.5	29.1	3.00	33.5	3,613	8.03	9.5	"
French	35,240	154	86.4	3.00	1.77	6.3	17.3	30.8	3.79	43.2	4,437	27.42	9.5	Screw
Austrian	30,380	126	66.4	2.95	2.33	8.0	18.2	34.4	3.52	49.5	4,860	13.83	7.5	Wedge
Russian	29,230	119	58.5	2.57	2.88	10.9	15.4	36.1	3.32	49.6	4,804	12.81	7.1	"
English, M. L.	26,500	118	66.1	3.82	2.37	9.6	24.0	44.4	4.59	58.6	2,667	22.89	18.	M. L.
Italian	30,000	124	69.3	2.80	2.35	9.9	19.5	35.6	3.79	56.7	5,409	13.90	7.	Wedge
U. S., 3".2.....	37,000	132	83.0	2.41	1.64	8.4	15.6	25.3	3.11	51.0	6,363	20.00	5.28	Screw

"Proposed"†.....	91	90	88	91	68	73	91	76	94	96	72	100	56	Safe
German	91	86	79	94	81	90	100	87	100	100	73	89	53	Safe
French	75	77	68	80	92	100	90	84	80	77	60	26	53	(?)
Austrian	97	93	87	82	70	79	85	73	85	69	55	51	42	Safe
Russian	81	99	100	94	57	60	85	70	90	69	57	55	40	Safe
English, M. L.	100	100	88	85	69	65	65	57	65	57	100	31	100	Safe
Italian	97	95	84	86	69	60	80	71	79	59	49	51	39	Safe
U. S., 3".2.....	72	90	70	100	100	76	99	100	96	66	42	35	29	(?)

"Proposed"†.....	31,000	157	74.0	2.70	2.39	8.6	16.4	37.8	3.50	22.9	2,793	5.38	16.	Wedge
German	30,845	154	70.7	2.70	2.44	7.9	15.0	35.6	3.23	22.4	3,370	8.43	12.	"
Russian	29,000	179	85.5	1.77	2.12	9.2	14.9	30.9	3.92	30.4	2,938	7.77	14.4	"
French	33,000	161	83.6	3.00	2.05	8.1	19.5	36.9	4.21	33.2	3,987	15.94	12.8	Screw
English, M. L.	26,000	146	74.2	3.43	2.34	9.4	22.6	49.6	5.33	44.4	4,913	20.50	12.	M. L.

"Proposed"†... ..	84	92	95	65	86	92	89	82	92	98	100	100	100	Safe
German	84	94	100	65	84	100	99	87	100	100	83	64	75	Safe
Russian	89	81	82	100	92	86	100	100	82	74	95	71	90	Safe
French	80	90	84	56	100	97	76	74	77	69	70	37	80	(?)
English, M. L.	100	100	94	51	87	84	66	62	65	50	57	27	75	Safe

†By the Compiler.

HORSE ARTILLERY

st- y ge.	Gun.				Wheel.			Load per inch of tire.			Lumber.					Weight of Projections.		
	Furni- ture.	Lbs.	In round shot.	To fire 1 lb. of proj.	Lbs.	Diam.	Tread.	Lumber	Gun.	Caisson body.	Equip.	Body.	Chest.	Total.	Packed.	In Lim- ber.	In cas- sion body.	Per Gun.
11	LBS.		LBS.		LBS.	IN.	IN.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
Wedge	789	222	57.7	156	57.18	2.60	256	344	402	82	280	170	854	1,330	405	78	2,160	
"	802	151	52.5	151	55	2.56	387	352	535				1,427	1,982	460	98	2,533	
"	858	214	70.5	150	55	2.36	423	417	453				1,433	2,000	462	98	1,873	
M. L.	896	250	67.6	252	60	3.00	333	360	431	62	538	331	1,445	2,039	477	98	1,881	
Wedge	658	193	62.6	186	54	2.56	338	329	497				1,230	1,734	420	98	1,680	
Screw	935	228	74.5	226	56.5	2.36	396	445	541	53	258	99	862	1,397	363	73	2,006	
"	800	184	61.5	200	57.5	2.75	285	371	401	82	405	185	1,072	1,567	390	441	1,038	

RELATIVE VALUES, &c., OF HORSE ART

	100	100	100*	100*	100	100	100*	100*	100*	100*	100*	100*	100*	100	100	100	
Safe	84	89	91	96	95	87	100	95	100				100	100	85	81	85
Safe	88	60	100	99	92	85	66	93	75				60	67	96	100	100
Safe	91	85	74	100	92	79	60	80	90				59	67	96	64	75
Safe	96	100	77	60	100	100	77	91	93				58	66	100	99	75
Safe	70	77	82	81	90	85	76	100	81				70	77	90	50	86
(?)	100	91	70	67	94	79	86	74	74				99	95	76	80	80
(?)	85	74	83	75	96	92	89	89	100				80	85	77	40	88

LIGHT FIELD GUNS.

Wedge	1,065	204	59.2	174	57	2.90	253	380	440	82	292	175	897	1,469	468	1,066	2,700
"	990	178	55.2	192	55	2.76	380	393	463				1,419	2,098	674	690	2,359
Screw	1,166	198	64.8	226	58.5	2.83	327	470	564	68	389	316	1,225	1,850	469	875	2,489
Wedge	1,071	268	77.0	196	54	3.76	352	412	505				1,295	1,941	535	814	2,014
"	1,006	251	65.5	151	55	2.56	386	419	535				1,427	1,978	461	831	2,333
M. L.	1,344	218	75.1	252	60	3.00	306	488	529	62	534	230	1,330	1,834	430	1,066	2,543
Wedge	1,082	270	73.4	194	58.5	2.76	359	447	447				1,369	1,978	501	960	1,916
Screw	800	184	61.5	200	57.5	2.75	288	382	457	82	405	185	1,072	1,584	403	671	2,015

RELATIVE VALUES, &c., OF LIGHT

Safe	79	76	93	87	95	97	100	100	100				100	100	69	81	100
Safe	74	66	100	79	92	92	66	97	95				63	70	100	58	83
(?)	87	76	85	67	98	94	77	81	79				73	79	88	70	98
Safe	80	90	71	100	90	92	72	92	88				70	75	80	90	74
Safe	76	93	84	77	92	85	65	92	82				62	74	68	75	93
Safe	100	80	73	60	100	100	84	78	83				67	80	63	100	93
Safe	80	100	74	77	98	92	72	85	98				66	74	74	85	71
(?)	60	70	88	75	96	92	88	99	96				84	92	60	50	74

HEAVY FIELD GUNS.

Wedge	1,575	216	57.2	200	57	3.40	254	411	374	93	292	185	970	1,729	605	1,100	3,465
"	1,375	191	51.7	192	55	2.76	360	458	541				1,283	1,990	585	815	3,458
"	1,370	140	49.8	151	55	2.56	387	516	535				1,427	1,982	495	1,065	3,468
Screw	1,553	234	64.7	262	58.5	3.15	293	501	541	68	389	312	1,221	1,848	432	873	3,072
M. L.	2,005	235	80.0	256	60	3.00	317	614	446	157	535	175	1,369	1,900	450	1,150	2,500

RELATIVE VALUES, &c., OF HEAVY FIELD

Safe	79	92	87	75	95	100	100	100	100				100	100	100	71	100
Safe	68	81	96	78	92	81	70	90	69				75	87	97	54	98
Safe	68	60	100	100	92	75	65	80	70				68	88	82	90	100
(?)	77	99	77	58	98	93	86	82	69				80	93	71	61	89
Safe	100	100	62	60	100	90	80	67	92				78	91	74	100	72

HORSE ARTILLERY

Bursting charge.	Gun.				Wheel.			Load per inch of tire.			Limber.					Weight of Projectiles.	
	Furniture.	Lbs.	In round shot.	To fire 1 lb. of proj.	Lbs.	Diam.	Tread.	Limber	Gun.	Caisson body.	Equip.	Body.	Chest.	Total.	Packed.	In Limber.	In caisson body.
OZ.	11	LBS.		LBS.	LBS.	IN.	IN.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
10.	Wedge	789	222	57.7	156	57 ¹ / ₂	2.60	256	344	402	82	280	170	854	1,330	405	756
7.1	"	802	151	52.5	151	55	2.56	387	352	535				1,427	1,982	460	931
7.8	"	858	214	70.5	150	55	2.36	423	417	453				1,433	2,000	462	966
10.	M. L.	896	250	67.6	252	60	3.00	333	360	431	62	538	331	1,445	2,039	477	926
4.4	Wedge	658	193	62.6	186	54	2.56	338	329	497				1,230	1,734	420	463
8.1	Screw	935	228	74.5	226	56.5	2.36	396	445	541	53	258	99	862	1,397	363	731
5.28	"	800	184	61.5	200	57.5	2.75	285	371	401	82	405	185	1,072	1,507	390	442

RELATIVE VALUES, &c., OF HORSE

100		100	100	100*	100*	100	100	100*	100*	100*	100*	100*	100*	100*	100*	100	100
100	Safe	84	89	91	96	95	87	100	95	100				100	100	85	81
71	Safe	88	60	100	99	92	85	66	93	75				60	67	96	100
78	Safe	91	85	74	100	92	79	60	80	90				59	67	96	64
100	Safe	96	100	77	60	100	100	77	91	93				58	66	100	99
44	Safe	70	77	82	81	90	85	76	100	81				70	77	90	50
81	(?)	100	91	70	67	94	79	86	74	74				99	95	76	80
53	(?)	85	74	83	75	96	92	89	89	100				80	85	77	49

LIGHT FIELD G

10.	Wedge	1,065	204	59.2	174	57	2.90	253	380	440	82	292	175	897	1,469	468	1,026
9.5	"	990	178	55.2	192	55	2.76	380	393	463				1,419	2,098	674	690
9.5	Screw	1,166	198	64.8	226	58.5	2.83	327	470	564	68	389	316	1,225	1,850	469	875
7.5	Wedge	1,071	268	77.0	196	54	3.76	352	412	505				1,295	1,941	535	614
7.1	"	1,006	251	65.5	151	55	2.56	386	419	535				1,427	1,978	461	931
18.	M. L.	1,344	218	75.1	252	60	3.00	306	488	529	62	534	230	1,330	1,834	430	1,246
7.	Wedge	1,082	270	73.4	194	58.5	2.76	359	447	447				1,369	1,978	501	560
5.28	Screw	800	184	61.5	200	57.5	2.75	288	382	457	82	405	185	1,072	1,584	403	671

RELATIVE VALUES, &c., OF L

56	Safe	79	76	93	87	95	97	100	100	100				100	100	69	82
53	Safe	74	66	100	79	92	92	66	97	95				63	70	100	56
53	(?)	87	76	85	67	98	94	77	81	79				73	79	88	70
42	Safe	80	99	71	100	90	92	72	92	88				70	75	80	50
40	Safe	76	93	84	77	92	85	65	92	82				62	74	68	75
100	Safe	100	80	73	60	100	100	84	78	83				67	80	63	100
39	Safe	80	100	74	77	98	92	72	85	98				66	74	74	45
29	(?)	60	70	88	75	96	92	88	99	96				84	92	60	50

HEAVY FIELD

16.	Wedge	1,575	216	57.2	200	57	3.40	254	411	374	93	292	185	970	1,729	605	1,100
12.	"	1,375	191	51.7	192	55	2.76	360	458	541				1,283	1,990	585	835
14.4	"	1,370	140	49.8	151	55	2.56	387	516	535				1,427	1,982	495	1,485
12.8	Screw	1,553	234	64.7	262	58.5	3.15	293	501	541	68	389	312	1,221	1,848	432	972
12.	M. L.	2,005	235	80.0	256	60	3.00	317	614	446	157	535	175	1,369	1,900	450	1,536

RELATIVE VALUES, &c., OF HE

100	Safe	79	92	87	75	95	100	100	100	100				100	100	100	72
75	Safe	68	81	96	78	92	81	70	90	69				75	87	97	54
90	Safe	68	60	100	100	92	75	65	80	70				68	88	82	96
80	(?)	77	99	77	58	98	93	86	82	69				80	93	71	62
75	Safe	100	100	62	60	100	90	80	67	92				78	91	74	100

OF HORSE ARTILLERY GUNS, CONCLUDED.

Weight of Projectiles.			Total weight powder	Carriage.			Gun and Carriage.												To fire 1 lb. of proj.
In Limber.	In caisson body.	Per Gun		Weight	Ratio to Gun.	To fire 1 lb. of proj.	Track.	Impis.	Seats.	Brake.	Elev. gear.	Axle.	Body.	Total.	Elevation. (+) (—)				
LBS.	LBS.	LBS.	LBS.	LBS.		LBS.	IN.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	O	O	LBS.	
405	756	2,160	440	1,001	1.26 ¹⁸	74.0	60	20		60	54	124	555 ¹⁴	1,790	15		10	133	
460	931	2,533	521	968	1.24	65.1	65	21		24	54	133	501	1,802	25			117	
462	596	1,873	424	1,098	1.29	91.2	60	39		88	52	123	547	1,968	23			162	
477	926	1,881	444	1,346	1.50	101.5	62	20	60	41	105	98	579	2,303	16			165	
420	463	1,680	316	1,227	1.56	97.8	60.25	22		87	54	98	492	1,685	17			160	
363	731	2,006	528	1,166	1.25	92.8	56.5	33		87	72	99	423	2,101	25			167	
390	442	1,038	473	1,254	1.58	98.9	60	20		38	102	136	694	2,056	20			156	

OF HORSE ARTILLERY GUNS, CONCLUDED.

100	100	100	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100*	100	100	100*
85	81	85	72	97	98	88	92	100		40	96	79	76	94	60		88
96	100	100	60	100	100	100	100	95		100	96	74	85	93	100		100
96	64	75	75	88	96	71	92	51		27	100	80	77	84	92		72
100	99	75	70	72	83	65	96	100		60	51	100	73	73	64		71
90	50	86	100	94	80	66	93	91		27	96	100	86	100	68		74
76	80	80	60	83	99	69	87	60		27	75	99	100	80	100		70
77	49	65	67	79	78	66	92	100		63	53	71	61	83	80		75

OF FIELD GUNS, CONCLUDED.

468	1,026	2,700	518	1,138	1.07	63.0	60	21	60	65	76	151	572	2,203	26	10	122
674	690	2,259	416	1,160	1.17	65.0	60	39	77	91	67	151	530	2,168	25	10	121
469	875	2,489	577	1,496	1.28	80.3	60	41	116	115	73	151	548	2,662	25		146
535	614	2,014	422	1,212	1.13	68.0	60.25	40	83	93	69	155	535	2,283	15		145
461	931	2,533	521	1,076	1.07	71.0	66	21	69	24	58	162	636	2,114	22		137
430	1,246	2,542	426	1,586	1.18	88.6	62	38	129	50	79	157	637	2,930	17		163
501	560	1,916	415	1,355	1.25	93.0	60.25	39	77	114	77	163	691	2,468	10		167
403	671	2,015	581	1,300	1.63	100	60	20	46	38	102	136(?)	694	2,100	20		161

&c., OF LIGHT FIELD GUNS, CONCLUDED.

69	82	100	80	95	100	100	91	95	77	37	76	90	93	95	100		98
100	56	83	99	93	91	95	91	51	60	26	86	90	100	97	96		100
88	70	92	72	72	83	79	91	49	40	21	79	90	96	79	96		79
80	50	74	80	89	85	92	92	55	55	25	84	88	99	92	58		79
68	75	93	98	100	100	90	100	95	67	100	100	84	83	99	85		84
63	100	93	97	68	90	71	94	53	36	48	73	86	83	71	65		80
74	45	71	100	79	84	69	92	51	60	21	75	88	76	85	38		68
60	50	74	72	82	66	66	91	100	100	63	57	100	77	100	77		71

OF FIELD GUNS, CONCLUDED

605	1,100	3,465	748	1,218	0.77	44.4	60	26		75	78	177	640	2,793	20	15	102
585	835	3,458	744	1,153	0.84	43.3	60	38		97	74	173	560	2,528	25	10	95
495	1,485	3,465	504	1,274	0.93	46.3	65	31	69	24	63	181	787	2,644			96
432	972	3,072	591	1,637	1.05	68.2	60	54	116	115	81	177	570	3,190			133
450	1,536	2,500	400	1,680	0.84	67.2	62	49	90	50	92	174	701	3,685	45	5	147

OF HEAVY FIELD GUNS, CONCLUDED.

60	72	100	53	94	100	97	92	100		32	81	98	88	90			97
97	54	98	52	100	92	100	92	70		24	85	100	100	100			100
82	96	100	79	90	83	93	100	84		100	100	96	71	71			99
71	62	89	68	69	73	63	92	48		21	78	98	98	80			71
74	100	72	100	68	92	64	96	53		48	68	99	80	70			64

Gun and Carriage.										Rounds.		Caisson body.		
Elev. gear.	Axle.	Body.	Total.	Elevation.		To fire 1 lb. of proj.	Per ton pressure bottom bore.	Per ton of charge.	In Limber.	Per Gun.	Rounds.	No.	To weight per gun.	
				(+)	(-)									
LBS.	LBS.	LBS.	LBS.	0	0	LBS.	LBS.	LBS.	NO.	NO.	NO.	NO.	LBS.	
54	124	555 ¹⁴	1,790	15	10	133	168	651 ¹⁴	30	160	56	9	2,300	
54	133	501	1,802	25		117	145	570	30	165	60	9	2,350	
52	123	547	1,968	23		162	177	719	38	154	70	8	2,100	
105	98	579	2,303	16		165	190	714	36	142	70	6	2,500	
54	98	492	1,685	17		160	185	806	40	152	44	8	2,500	
72	99	423	2,101	25		167	173	636	29	160	58	9	2,600	
102	136	604	2,056	20		156	154	549	30	126	34	9	2,200	

* 100*	100*	100*	100*	100	100	100*	100*	100*	100	100	100	100*	100
96	79	76	94	60		88	86	84	75	97	80	67	8
96	74	85	93	100		100	100	96	75	100	86	67	10
100	80	77	84	92		72	82	76	95	93	100	75	7
51	100	73	73	64		71	76	76	90	86	100	100	9
96	100	86	100	68		74	78	68	100	92	63	75	9
75	99	100	80	100		70	84	86	72	97	83	67	9
53	71	61	83	80		75	94	100	75	76	50	67	8

76	151	572	2,203	26	10	122	169	638	26	150	57	9	9,200
67	151	530	2,168	25	10	121	159	657	32	126	38	8	2,550
73	151	548	2,662	25		146	172	636	26	138	48	9	3,100
69	155	535	2,283	15		145	181	692	34	128	44	8	2,750
58	162	636	2,114	22		137	177	668	30	165	60	9	2,700
79	157	637	2,930	17		163	248	977	24	142	94	6	2,900
77	163	691	2,468	10		167	199	733	34	130	38	8	2,450
102	136(?)	604	2,100	20		161	159	560	31	155	52	9	2,550

76	90	93	95	100		98	94	88	72	91	61	67	100
86	90	100	97	96		100	100	85	90	76	40	75	28
79	90	96	79	96		79	92	88	72	84	51	67	34
84	88	99	92	58		79	88	81	94	78	47	75	30
100	84	83	99	85		84	89	84	84	100	64	67	29
73	86	83	71	65		70	64	57	100	86	100	100	32
75	88	76	85	38		68	79	76	94	80	40	75	26
57	100	77	100	77		71	100	100	86	94	55	67	27

78	177	640	2,793	20	15	102	178	470	22	126	40	10	11,000
74	173	560	2,528	25	10	95	164	442	22	130	32	12	2,900
63	181	787	2,644			96	147	633	18	126	54	9	2,740
81	177	570	3,190			133	192	690	18	128	42	12	3,400
92	174	701	3,685	45	5	147	254	921	18	100	64	6	2,670

81	98	88	90			97	84	94	100	97	62	60	100
85	100	100	100			100	90	100	100	100	50	50	27
100	96	71	71			99	100	70	82	97	84	67	25
78	98	98	80			71	76	64	82	99	66	50	29
68	99	80	70			64	58	48	82	80	100	100	24

Caisson body.			Horses.		Mobility (per horse).		Smoke.	Volume of fire.	Total.	Order of Merit.	
No.	Total weight proj's.		Gun.	Caisson	Gun.	Caisson				No.	
NO.	LBS.		NO.	NO.	LBS.	LBS.	18	17			
9	2,304	6	6	520	570	275	256				
9	2,740	6	6	631	787	316	221				
8	2,140	6	6	661	690	275	161				
6	2,539	6	6	704	763	313	165				
8	2,544	6	6	569	713	209	142				
9	2,653	6	6	583	675	330	136				
9	2,207	6	6	601	629	375	155				

100*	100	100*	100*	100*	100*	100*	100	8,500			
67	84	100	100	100	100	76	100	7,428	1	"Proposed."	
67	100	100	100	82	72	65	90	7,218	2	Russian.	
75	78	100	100	79	83	76	63	6,732	3	English, M. L.	
100	93	100	100	74	74	68	64	6,848	4	German.	
75	93	100	100	91	80	100	55	6,653	5	French.	
67	97	100	100	87	84	64	55	6,723	6	Austrian.	
67	80	100	100	89	90	56	60	6,553	7	U. S., 3".2.	

9	9,234	6	6	612	670	345	360				
8	2,558	6	6	711	776	330	320				
9	3,190	6	6	733	840	418	164				
8	2,787	6	6	704	788	330	219				
9	2,74	6	6	682	787	316	222				
6	2,918	8	8	594	626	300	195				
8	2,468	6	6	741	741	319	219				
9	2,514	6	6	614	683	375	155				

8,600

67	100	100	100	97	93	87	100	7,572	1	"Proposed."	
75	28	100	100	83	81	91	90	7,288	2	German.	
67	34	100	100	81	74	72	46	6,968	3	French.	
75	30	100	100	84	80	91	61	6,582	4	Russian.	
67	29	100	100	87	80	95	62	6,881	5	U. S., 3".2.	
100	32	75	75	100	100	100	54	6,672	6	English, M. L.	
75	26	100	100	80	86	94	61	6,424	7	Austrian.	
67	27	100	100	97	80	80	43	6,679	8	Italian.	

10	11,000	6	6	754	712	594	597				
12	2,984	6	6	753	829	572	377				
9	2,740	6	6	771	787	401	436				
12	3,408	6	6	839	876	462	270				
6	2,678	6	6	898	763	400	255				

8,420

60	100	100	100	100	100	68	100	7,456	1	"Proposed."	
50	27	100	100	100	86	70	63	7,033	2	German.	
67	25	100	100	97	90	100	73	6,999	3	Russian.	
50	29	100	100	90	81	86	45	6,490	4	French.	
100	24	100	100	83	92	100	43	6,478	5	English, M. L.	

"IN BATTERY"—BATTLE CONDITIONS, HORSE ARTILLERY GUNS.

Nation.	Proj.	d ³ /w	Bullets.	4500 yards.		Smoke.	Volume of Fire.	Totals.	No.	Order of Merit.
				Ve-locity.	Energy					
	lbs.		No.	f. s.	f. t.					
"Proposed."†	13.50	0.666	216	710	47	275	256			
Russian.....	15.35	0.724	165	615	40	316	221			
English, M. L.	13.25	0.678	116	737	50	313	165			
German....	12.16	0.785	133	675	38	275	161			
French.....	12.54	0.791	93	648	37	330	136			
Austrian.....	10.51	0.837	105	593	26	209	142			
U. S. 3".2....	13.00	0.787	107	675	41	375	155			

BATTLE CONDITIONS, RELATIVE VALUES, &c., H. A. GUNS.

Max. Value..	100	100*	100	100	100	100*	100	700			%
"Proposed."†	88	100	100	96	94	76	100	654	1	"Proposed."	100
Russian.....	100	93	76	83	80	65	90	587	2	Russian.	90
English M. L.	86	98	54	100	100	68	64	570	3	English M. L.	87
German.....	79	85	57	92	76	76	63	528	4	German.	81
French.....	80	84	43	88	74	64	53	486	5	U. S. 3".2.	77
Austrian.....	69	80	50	81	52	100	55	487	6	Austrian.	74
U. S. 3".2....	84	84	50	92	82	56	60	508	7	French. ¹⁸	74

BATTLE CONDITIONS, LIGHT FIELD GUNS.

"Proposed."†	18.00	0.642	310	727	66.0	345	360				
German.....	17.93	0.667	270	722	64.7	330	320				
French.....	18.04	0.694	97	702	61.7	418	164				
English, M. L.	17.90	0.766	128	638	50.0	300	195				
Austrian....	15.74	0.747	165	649	46.0	330	219				
Russian.....	15.35	0.724	165	636	42.6	316	222				
Italian.....	14.74	0.797	177	652	43.5	319	219				
U. S. 3".2....	13.00	0.787	107	675	41.2	375	155				

BATTLE CONDITIONS, RELATIVE VALUES, &c., LIGHT FIELD GUNS.

"Proposed."†	99	100	100	100	100	87	100	686	1	"Proposed."	100
German.....	96	96	90	99	98	91	90	560	2	German.	83
French.....	100	92	30	97	93	72	46	530	3	Austrian.	79
English, M. L.	96	84	41	88	76	100	54	537	4	English, M. L.	79
Austrian.....	85	88	53	89	70	91	61	537	5	Russian.	78
Russian.....	83	89	53	88	64	95	62	534	6	French. ¹⁸	77
Italian.....	80	80	54	90	65	94	61	504	7	Italian.	74
U. S. 3".2....	70	81	54	93	63	80	43	464	8	U. S. 3".2.	70

BATTLE CONDITIONS, HEAVY FIELD GUNS.

"Proposed."†	27.50	0.535	519	797	122	594	597				
German.....	26.40	0.541	300	783	113	572	377				
Russian.....	27.50	0.635	340	675	88	401	436				
English, M. L.	25.00	0.640	180	691	93	400	255				
French.....	24.00	0.582	204	758	96	462	270				

BATTLE CONDITIONS, RELATIVE VALUES, &c., H. F. GUNS.

"Proposed."†	100	100	100	100	100	68	100	668	1	"Proposed."	100
German.....	96	97	58	98	93	70	63	575	2	Russian.	87
Russian.....	100	83	65	85	72	100	73	578	3	German.	86
English, M. L.	91	82	35	87	68	100	43	506	4	French. ¹⁸	80
French.....	89	90	46	96	80	86	45	532	5	English, M. L.	76

† By the Compiler.

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NOTES.

1. Under the supposition, for purposes of comparison, that all projectiles are shrapnel.
2. All proportions marked thus * are, from their nature, or from the conditions and requirements of artillery service, inversely as the powers to which they are raised.
3. Perpendicular to, and parallel with the line of fire.
4. Energy of charge due to the number of expansions obtained, from the table of Noble and Able.
5. This is, of course, the converse of the usual expression of "factor of efficiency."
6. The range of 4500 yards is assumed to be the maximum practicable for service—or even desirable until satisfactory telescopes are assured. Whatever this range may be, it is of paramount importance, as the remaining velocity at this range determines the size of the gun which will be effective, and consequently, to a large extent, their number, and hence the man or horse killing or disabling power. The remaining velocity, of course, also enters largely in determining the power of the gun as against inanimate objects, and has a greater importance than the initial velocity.
7. This presents one of the most reliable measures as to the excellence of results obtained, due to excellence in design, etc.
8. The mean velocity for the "proposed" guns for all ordinary battle ranges exceeds the velocity of sound. This, by some, is deemed an essential requisite, but modern battle conditions necessitate the concentration of guns in large batteries, where this factor is of little consequence.
9. The G. D. for the powder for all of the "proposed" guns has been assumed unnecessarily low, hence the low measure of "strain upon the carriage," and "strain upon the carriage," resulting in unnecessarily high factors as to the weight of material for the work required, and consequent loss of relative value. Greater G. D. will bring these factors down more nearly in accord with the best results presented, and will considerably increase the powers of the guns.
10. To insure the best results for a given weight of carriage, it is manifestly imperative that the weight and calibre of the gun be such as to insure the minimum of strain. The factors for the U. S. 3".2 gun apparently evince great excellence, but the conditions are such as to produce an enormous strain upon the carriage, and the result is that an astonishingly small amount of useful ballistic work is accomplished. The best factors respecting the wheel—and from the "work of recoil" also—serve to indicate very clearly the weight of wheel required to meet a given condition as to strain or work of recoil; these within reason, the wheel can be as light as possible, and meet the conditions as to tread and the requisite size of the axle arm.
11. It remains a *sine que non* that a gun must be absolutely safe. The recent quite marked failures of the French screw gun calibres, both old and new models,—when fired with ordinary service charges, and of field guns when fired with even blank cartridges, indicate a grave doubt as to the safety of this *fermeture*. Consequently such guns should be ruled out of any comparison with others which are absolutely safe, and for this reason the wedge *fermeture* predominates among these guns.
12. The "tread" of the wheel is of very great importance, so much so in fact, that it should be made to conform to the load it has to carry, though it necessitate a different wheel for each class of gun. Upon the road the tread of the wheel is a matter of little moment, but on the battle field it is almost inevitable that the gun will be run off the road, upon cultivated, even recently ploughed ground, and often wet at that, when it becomes a matter of vital moment. The tread and diameter of the wheel have more to do with determining its weight, than has the strength when excellence of design has insured the work imposed within reasonable limits. Aside from this the wheel, even of olden times, has always proved the most reliable element in field artillery *matériel*.
13. This factor at once determines whether the design meets the conditions of insuring reasonable strain upon the carriage.
14. The axle body has finally to withstand the strains imposed by firing the gun. That one which, for the least weight insures the maximum amount of useful work, must unquestionably be considered the best, and especially is this so when it is remembered that the conditions of the construction of such *matériel* that the maximum result must be assured with the least weight of carriage.
15. Although the weight of the carriage must be at a minimum, that for the gun and carriage must be at the maximum, for the greater this weight the more powerful the gun. This factor seems to indicate what should be the charge of powder for any given gun and carriage secured, without imposing undue strains in the effort to control the recoil due to large charges for light weight. The results very clearly that the best results are not obtained with excessive charges, but by proper conditions applied to very reasonable comparison. To secure the maximum weight of gun and carriage, and consequently the maximum of power for the gun, evidently the extraordinary excellence in the design and construction of the *limber*, and this can only be secured with a light wheel, and it is the effort must commence for the development of a good gun.
16. The reason for the vigorous restriction of the weight of the powder charge would seem to be made more apparent here than elsewhere. The artilleryman in battle does not desire to assume a peculiarity of the cuttle-fish, and shroud himself in obscurity, hence his constant use of a "smokeless" powder. So long as this is not forthcoming, the less powder he has to burn the better. Nor should the very intense smoke be lost sight of, that the higher the G. D., the less the smoke for the same weight, due, no doubt, to more perfect combustion, etc.
17. As measured by the bullets and fragments of a single shrapnel, and is the direct measure of the chances of hitting, and of disabling men and horses. It is, other things being equal, determined by the remaining velocity, which is in turn determined by the efficiency (d^2/w) of the projectile, by far the most important element in the determination of the power of a gun, and indirectly also in the securing of the maximum of useful work with the minimum weight of carriage.
18. The influence which the weight of wheel has upon *matériel* is perfectly illustrated in the cases of the French guns. The unnecessary weight of their wheels has not only very seriously impaired their mobility, but also to an astonishing extent their power. Some of the absurd weight of wheels put into the projectiles, and a suitable powder charge maintained, with a G. D. insuring a factor of efficiency, then guns could readily be converted into the best in Europe.

CONDITIONS, HORSE ARTILLERY GUNS.

Yards.	Smoke.	Volume of Fire.	Totals.	No.	Order of Merit.
Energy					
f. t.					
47	275	256			
40	316	221			
50	313	165			
38	275	161			
37	330	136			
26	209	142			
41	375	155			

RELATIVE VALUES, &c., H. A. GUNS.

100	100*	100	700			%
94	76	100	654	1	"Proposed."	100
80	65	90	587	2	Russian.	90
100	68	64	570	3	English M. L.	87
76	76	63	528	4	German.	81
74	64	53	486	5	U. S. 3".2.	77
52	100	55	487	6	Austrian.	74
82	56	60	508	7	French. ^{1a}	74

VALUES, &c., LIGHT FIELD GUNS.

66.0	345	360			
64.7	330	320			
61.7	418	164			
50.0	300	195			
46.0	330	219			
42.6	316	222			
43.5	319	219			
41.2	375	155			

RELATIVE VALUES, &c., LIGHT FIELD GUNS.

100	87	100	686	1	"Proposed."	100
98	91	90	560	2	German.	83
93	72	46	530	3	Austrian.	79
76	100	54	537	4	English, M. L.	70
70	91	61	537	5	Russian.	78
64	95	62	534	6	French. ^{1a}	77
65	94	61	504	7	Italian.	74
63	80	43	464	8	U. S. 3".2.	70

VALUES, &c., HEAVY FIELD GUNS.

122	594	597			
113	572	377			
88	401	436			
93	400	255			
96	462	270			

RELATIVE VALUES, &c., H. F. GUNS.

100	68	100	668	1	"Proposed."	100
93	70	63	575	2	Russian.	87
72	100	73	578	3	German.	86
68	100	43	506	4	French. ^{1a}	80
80	86	45	532	5	English, M. L.	76

1. Under the supposition, for purposes of comparison, that all
2. All proportions marked thus * are, from their nature, or from
3. Perpendicular to, and parallel with the line of fire.
4. Energy of charge due to the number of expansions obtained
5. This is, of course, the converse of the usual expression of "
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10. To insure the best results for a given weight of carriage, it is as to insure the minimum of strain. The factors for the U. S. 3". are such as to produce an enormous strain upon the carriage, and the work is accomplished. The best factors respecting the wheel—and weight of wheel required to meet a given condition as to strain or v be made, and meet the conditions as to tread and the requisite size o

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Reprints and Translations.

A BRITISH TRIBUTE TO WASHINGTON.

(Reprinted from the Penny Magazine, London, Nov. 24, 1838.)

IN Washington we truly behold a marvellous contrast to almost every one of the endowments and the vices which we have been contemplating, and which are so well fitted to excite a mingled admiration, and sorrow, and abhorrence. With none of that brilliant genius which dazzles ordinary minds; with not even any remarkable quickness of apprehension; with knowledge less than almost all persons in the middle ranks, and many well educated persons of the humbler classes possess; this eminent person is presented to our observation, clothed in attributes as modest, as unpretending, as little calculated to strike or astonish, as if he had passed unknown through some secluded region of private life. But he had a judgment sure and sound; a steadiness of mind which never suffered any passion, or even any feeling to ruffle its calm; a strength of understanding which worked rather than forced its way through all obstacles; removing or avoiding rather than overleaping them. His courage, whether in battle or in council, was as perfect as might be expected from this pure and steady temper of soul. A perfectly just man, with a thoroughly firm resolution never to be misled by others, any more than by others overawed; never to be seduced or betrayed, or hurried away by his own weaknesses or self-delusions, any more than by other men's arts; nor ever to be disheartened by the most complicated difficulties, any more than to be spoilt on the giddy heights of fortune—such was this great man—whether we regard him sustaining alone the whole weight of campaigns, all but desperate or gloriously terminating a just warfare by his resources and his courage; presiding over the jarring elements of his political council, alike deaf to the storms of all extremes, or directing the formation of a new government for a great people, the first time that so vast an experiment had ever been tried by man; or, finally retiring from the supreme power to which his virtue had raised him over the nation he had created and whose destinies he had guided as long as his aid was required; retiring with the veneration of all parties, of all nations, of all mankind, in order that the rights of men might be conserved, and that his example never might be appealed to by vulgar tyrants. This is the consummate glory of the great American; a triumphant warrior where the most sanguine had a right to despair; a successful ruler in all the difficulties of a course wholly untried; but a warrior whose sword only left its sheath when the first law

of our nature commanded it to be drawn ; and a ruler who, having tasted of supreme power, gently and unostentatiously desired that the cup might pass from him, nor would suffer more to wet his lips than the most solemn and sacred duty to his country and his God required !

To his latest breath did this great patriot maintain the noble character of a captain, the patron of peace, and a statesman, the friend of justice. Dying, he bequeathed to his heirs the sword which he had worn in the War for liberty, charging them " never to take it from the scabbard but in self-defense, or in defense of their country and their freedom ; and commanding them that when it should be thus drawn, they should never sheath it, nor ever give it up, but prefer falling with it in their hands to the relinquishment thereof"—words, the majesty and simple eloquence of which are not surpassed in the oratory of Athens and Rome. It will be the duty of the historian and the sage in all ages to omit no occasion of commemorating this illustrious man ; and until time shall be no more will a test of the progress which our race has made in wisdom and in virtue be derived from the veneration paid to the immortal name of Washington !

FORTRESS DEFENCE.

(From *Engineering*, London.)

CAPTAIN STONE'S contribution* to the subject of coast-defense is most welcome just now, as the necessity for any works on shore seems likely to be overlooked in the attention that is being paid to the Navy. There are some naval officers indeed who seem to advocate that we should spend all our money on floating defenses, and leave the land to look after itself—or rather have the sea to look after it. In the paper itself and during the discussion which followed, this aspect of the question occupied a good deal of attention. It is a subject, however, apart from the rest, and we will leave it for the present, hoping shortly to be able to say a few words upon the matter.

Putting aside, therefore, for the present, Captain Stone's well-considered opening remarks on naval strategy, we will suppose that fortresses are desirable adjuncts to a system of coast-defense, and consider the relation of quick-firing guns as a part of their armament. The paper was divided into two parts, the first of which dealt with sea-fronts and the next with land-fronts. For the present we must leave out of consideration those features which refer exclusively to the latter branch of the subject, which was of a more technical nature.

The author quotes a passage from the report of Mr. Stanhope's Committee. " Where mercantile ports are situated at some distance up a river, sub-marine mining defense will in general afford a very great protection. The Committee think it essential that wherever this is adopted, the mine-

* "Quick-Firing Guns for Fortress Defence," by Capt. F. G. Stone, R.A., (Instructor of Fortification, R. M. College, R. A. Inst.,) before the Royal U. S. Institution, Jan. 18, 1889.

fields should be protected by quick-firing guns." Captain Stone then proceeded to show: "Firstly, what the actual rôle of quick-firing guns should be. Secondly, how their extensive employment may be the means of adding to the efficiency of our defences at a much less cost than could be secured in any other way. We are to suppose that an attack is being made by the enemy's fleet, which is in a position to attack our sea-front. We take first the enemy's iron-clads; and here Captain Stone laments the very meagre data we have to go upon in framing an opinion. From the experience of the French at Sfax, however, and our own experience at Alexandria, it would appear that, so far as the artillery duel is concerned, the guns on shore are likely to have the best of it. "At Sfax, after a remarkably deliberate fire of 2002 projectiles, delivered under peace practice conditions, the defensive power of the place is reported to have been practically uninjured." At Alexandria, Fort Mecks, a work of antique construction armed with five heavy rifled muzzle-loading guns, nine smooth-bore guns, and five mortars, was engaged by the *Monarch*, *Penelope* and *Invincible* at 1200 yards, and the *Teméraire* at 3500 yards, for nearly four hours, during which time the *Inflexible* joined in for an hour at 3800 yards. During this period not a single Egyptian gun was disabled, and only two were touched, though, altogether, 580 heavy and 340 light projectiles had been discharged. On the other hand, the *Invincible* was hulled fifteen times and the *Penelope* eight times, in addition to receiving a round shot in one of her ports. Captain Clarke, R.E., commenting on this action, says: "If the gunners (*i. e.* the Egyptians) had been able to handle the rifled guns as well as they did the smooth-bores, and if the armament had been supplemented by a few machine- and quick-firing guns on the flank, the ships would have been defeated without any difficulty."

Captain Stone is of opinion that the fire from big guns on shipboard has been much too highly rated both in regard to accuracy and effect. In engaging a shore battery, there are the disadvantages of an unstable platform, and the necessity for engaging the battery at long ranges in order to compensate for the superior command of the shore guns. A shell striking the superior slope of a parapet with a horizontal trajectory, will do no damage to the revetment, and the splinters will be deflected clear of the emplacement; while shrapnel burst on the very crest would do little damage if its trajectory were horizontal.

The batteries, on the other hand, in addition to a more commanding position and stability of platform, have the advantages of being secure from distraction caused by torpedo boats, and the fire can be controlled, even in the most widely dispersed batteries, by the Watkins range-finder, by means of which the officer in charge can exactly time the fire of the group so as to strike the ship without fail whatever pace she may be going. "By the aid of quick-firing guns and the position finder," adds Captain Stone, "we are enabled to carry out the ideal system of defence, *viz.*, few guns in dispersed emplacements concealed by natural features." With regard to the effect of howitzer fire against batteries, the author states that at 3000 yards range, the 8 in. howitzer, with 11 1-2 lb. charge, is estimated to pitch 50 per cent. of its shells within a vertical rectangle 114 ft. in length

and 25 ft. in height. The angle of descent would be 12 deg. 24 min., or $\frac{1}{4}$, and this is the minimum range at which a ship's guns could engage an elevated shore battery with hope of success in regard to reaching effect. "Any attempt to move in closer, in order to improve the accuracy of the howitzer fire, would be done at the sacrifice of a large amount of gun-fire from the ships, and the risk of utter destruction to men and material from the quick-firing guns on shore."

For the effective protection of mine fields the quick-firing gun is a necessity in nearly all cases of importance. To remove the mines is the first operation before the enemy can make any progress. Sweeping, creeping, or countermining are the processes to which recourse would be had. All boat operations requiring time and deliberation, would be rendered impossible by the quick-firing gun. At night the electric light would be brought into play, and although this has lately proved in certain naval operations the reverse of beneficial to those using it, such a result has not been obtained in the case under consideration, where a definite area has to be searched, and upon which no friendly craft is likely to be employed unexpectedly. The protecting influence of fog or sea-mist must not, however, be forgotten; and, indeed, it is not improbable that fog may prove the ruling factor in many future naval operations. Fog is generally accompanied by calm weather, and formerly ships were not able to make much progress during its continuance. During three days of last summer, had we been at War, any of our enemy's steamers, capable of the speed, might have steamed at 18 knots from Brest to the Lizard without encountering any more risk than those of accidental collision; and it must be remembered that there would be very few merchant vessels knocking about in the Channel at such times. We think King Fog is not sufficiently considered by the naval strategists who are framing theories for our guidance in the coming struggle, whenever it may arrive.

However, we shall have to take our chance of fog, and Captain Stone is of opinion that the leading mode of attack will be attacks by day and surprises by night from the inshore squadron, which fog would be very favorable to in some respects. The only reliable defence against the inshore squadron will be, we are told, the extensive employment of quick-firing guns, of sufficient calibre, not merely to annihilate landing or boarding parties, or to send a torpedo boat to the bottom, but equal to the task of putting a gun-boat *hors-de-combat*. Quick-firing guns, the author goes on to say, whether made on the Hotchkiss, Armstrong, or Nordenfelt principle, or on the automatic Maxim system, are *non-recoiling*; thus there is an immense advantage gained, not merely by the mechanical or breech-closing arrangement, but also a great gain in time owing to the absence of recoil, and the avoidance of the necessity for relaying after every shot when firing at a stationary, or nearly stationary, object. Thus a 3-pounder quick-firing gun firing twenty rounds in a minute (which is about half its maximum rate), throws the same weight of shell as a 64-pounder muzzle-loading gun is capable of discharging in the same time; it has, moreover, a penetration of 4 in. into armor-plate, while the effect of successive rounds striking the same spot would be difficult to estimate. It may, however, be noted that

any kind of armor built up in segments, such as that of a Gruson turret, is affected most seriously by being struck two or three times in the same place. Moreover, the results obtained as regards the penetration of the shells of our new high velocity guns are notoriously unreliable; the shell usually turns off into the line of least resistance, and it seems fair to conclude that a rapid succession of comparatively small projectiles striking the same spot will produce a greater effect than the impact of a single very heavy projectile.

At some competitive trials carried out last year by the Admiralty between a 4 3-4 in. quick-firing gun and a 5 in. service breech-loading gun, the former fired ten consecutive aimed rounds in 48 seconds, and the penetration into wrought-iron equalled 10 1-4 in. The service breech-loading took 5 minutes 7 seconds to fire the same number. It does not appear necessary that quick-firing guns for this kind of defence should be of very large calibre; probably a 5 in. gun, throwing a projectile of about 40 lb., would be the maximum required, giving a penetration of 12 in. into wrought-iron. The penetration of the 5 1-4 in. quick-firing gun into wrought-iron equals 15 in. Any attempt to go beyond a 5-in. quick-firing gun for the purpose of obtaining higher penetration would be misplaced, though, doubtless, quite feasible; in fact, a 12-pounder quick-firing gun would serve most purposes, and the results already achieved by the 6-pounder Hotchkiss are instructive on this point. At Eastbourne a shell from one of these guns struck the chase of a 10.4-in. breech-loading gun and penetrated into the bore; at Shoeburyness a 9.2-in. breech-loading gun was struck on the chase and a bulge of nearly 1-2 in. raised on the interior of the bore, thus rendering it unserviceable. There can, therefore, be no question that these guns are sufficiently powerful to cope with an inshore squadron of gun and torpedo boats; they have, moreover, the immense advantage of being susceptible of rapid correction for laying and being capable of following up a moving object with continuous fire. To illustrate this we will suppose a torpedo boat advancing to within 400 yards of a shore battery of quick-firing guns in order to discharge its torpedo against some of the shipping in the harbor; the boat advances at the rate of, say 20 miles an hour, and the guns on shore open fire at 1000 yards range; the dangerous zone for the boat to cover in its advance is therefore 600 yards, and this would be accomplished in about one minute; this enables a 12-pounder quick-firing gun to fire from twelve to sixteen aimed shots, and gives the torpedo boat very little chance if it has to run the gauntlet of rapid fire from a battery of four to six of these guns. What chance would the best ordinary breech-loading gun have in such a case? At the very outside it could not put in more than two aimed shots.

Having so far treated of the points in favor of the type of weapon under discussion, the author next brought forward the two objections commonly raised against the employment of quick-firing guns. The first of these is the smoke, and the second complicated mechanism and liability to get out of order.

With regard to the first point, if smoke hangs over any gun it is impossible to lay it, "but in the case of the quick-firing gun we can, at any rate,

get in more shots than with the ordinary gun, inasmuch as the laying is not disturbed." But the author, in common with so many of his military *confrères*, puts great faith in the new smokeless explosives now attracting so much attention. The Chilworth Company have in some measure succeeded in obtaining good results, while a firm of gunmakers are within measureable distance of emulating the results recently obtained by the French.

There is no doubt that if the new explosives bear out all the promises made on their behalf, they will, as Lord Wolseley and Lord Charles Beresford said, completely revolutionize modern warfare. But we should like more data of the nature which only time and continued use can give before pronouncing too sweeping an approval. Sir Gerald Graham, in a speech, cautious, as became his position, hinted at certain difficulties still to be overcome before quick-firing guns could be pronounced so perfect as some would have us think, and, if we are not mistaken in our conjecture, the question of these new explosives was in his mind. Captain Parker, R.A., also referred to the Chilworth powder, and reminded the meeting of one very serious defect. If exposed for any time to the atmosphere at certain temperatures it becomes absolutely useless, changing to a mass of mud or slime. It is, however, a strong testimonial in favor of the new explosives, that one so clear-headed and eminently business-like and practical as Lord Wolseley should so strenuously support them, and we have no doubt that those difficulties, inevitable to all such inventions, will ultimately be overcome; at any rate, it is reassuring to have it on the authority of Lord Wolseley that our military officials know as much as those of foreign governments.

The absence of smoke, however, is not the only point in which the new explosives have an advantage. They are said to be both smokeless and noiseless. The latter expression must, however, be accepted *cum grano*, that is, "noiselessness" must be taken as a comparative term. The "noiselessness" is sufficient, however, for a man to be well within range and not hear the discharge, and perhaps there is nothing more awe-inspiring in battle than silence. Captain Stone quotes evidence on this point from an eye-witness who was present at the trials of the Maxim gun with smokeless powder in France. As he stood out on the range watching the results of the silent and invisible discharge from this weapon the effect was truly appalling, and of a character to shake the nerves of the stoutest hearted. Those who went with the fleet up to Constantinople, when the Russians were threatening that city a few years back, bear testimony to the awe-inspiring influence of that silent dread of torpedoes which might have been expected to explode any moment, far more terrible than the loudest roar of battle; and there were those who, without doubt, would have gone with credit through the hottest encounter, whose nervous system was affected for days after. An instance of older date was that which followed the blowing up of the *Orient* at the night action of Aboukir Bay. For several minutes after, both the English and French fleets ceased firing as if by common consent. The silence was far more trying than the loudest roar of battle, and it was only when the guns on each side again commenced

their thunder that this nerve tension was relaxed. The same thing has been chronicled by those taking part in night attacks on fortified positions when the enemy opening fire is said to have been a positive relief.

With regard to the second point, of complicated mechanism, Captain Stone very justly observes that we are far too ready to raise objections to new inventions on this score, and to forget that the same faults may exist under a different guise in those with which we are more familiar. With regard to guns, he suggests, it may be that we hear nothing of the failures of productions from Service factories, whilst anything from an extraneous source is watched by a host of hostile critics. The natural tendency, he says, appears to be to look out for defects rather than to discover good points.

It does not appear to occur, says Captain Stone, to those who habitually range themselves on the side of the opposition, that our new breech-loading guns can be put temporarily out of action by a single bullet bursting the thread of the screw on the breech-block, nor do they seem to realize that the terrific sand-storm, which is supposed to rage perennially around a machine-gun, as evidenced by the severity of the sand test, would be equally detrimental to the breech-closing apparatus of the magnificent guns of which our Royal Gun Factory has reason to be so justly proud. The following Table—taken from the Army return (Guns), April, 1887—will open the eyes of many to the fact that few guns are infallible, and that the occasional breakdown of ordnance of all descriptions is a contingency to be reckoned with, and not necessarily a reason for sweeping condemnation of any particular manufacture or design, whether it emanates from Woolwich or from a private firm :

Guns which have fired over 250 and under 1200 Rounds, with the Number of each Class Condemned or Repaired.

RIFLE MUZZLE-LOADING.

	10-inch.	11-inch.	12-inch.	12.5-inch.
Fired.....	40	4	4	5
Condemned or repaired.....	14	..	3	2

RIFLE BREECH-LOADING.

	4-inch	7-inch Armstrong, Old pattern.	16-inch
Fired.....	19	74	1
Condemned or repaired.....	7	8	..

Mr. Nordenfelt, in reference to this branch of the question, said that his quick-firing gun was no more complicated than the ordinary field-gun, and was quite prepared to put piece by piece on the table to prove the fact.

Captain Stone would place the batteries of quick-firing guns for sea-fronts in the highest and lowest positions, the intermediate sites being retained for heavy guns ; but he would make a clean sweep of the muzzle-loaders now in position, as those only lead to a false feeling of security, whilst really a source of extreme danger on account of complication of ammunition ; besides which they occupy valuable sites. With batteries

having only two tiers of fire, and where the heavy guns are near the water-line, the quick-firing guns should be placed on the flanks. The high-level tier should then attack the deck and machinery of iron-clads, the guns of the ships being unable to reply effectively except at long ranges or high elevation, and curved trajectory. The low tier would deal with the in-shore squadron, and the guns might be made muzzle-pivoting. With such arrangements the balance of advantages would lie, the author says, with the land defences.

In concluding this part of the subject the author says that "a couple of well-placed earthen barbette batteries containing a dozen quick-firing guns might do more for the defence of any given position than the most approved casemated battery or turret mounting an 80 or 100-ton gun. Mr. Anderson, C.E., stated his belief that the Dover turret would be so damaged by a single 16-in. shell that it would be impossible to work it any more. The energy of one of the bolts of the *Inflexible* striking, say, at 2000 yards range, would be represented by the whole of the Dover turret, which weighs 750 tons, rising 16 ft. into the air. Is it conceivable that no derangement would result from such a blow?"

The difference in the cost of pursuing such a system as the author advocated, or of following the old lines of massive iron and masonry fortifications and colossal guns, may be conjectured when we remember that the cost of the 100-ton Armstrong gun was 16,743*l.*, the Royal Gun Factory 13.5 in. gun of 67 or 69 tons was 10,859*l.* 12*s.* 7*d.*, the 80-ton muzzle-loading 9811*l.* 6*s.* 3 1-2*d.*, and the 38-ton muzzle-loading 3199*l.* 8*s.* 0 1-4*d.* When the cost of carriages, slides, transport, mounting, machinery, and protection is added to these figures, it may well make us pause to consider whether we are spending our money to the best advantage.

The author, in conclusion, summed up the substance in his lecture in the following words: "My main contention is that the task of defending our harbors, dockyards, and coaling stations is essentially a military question; that of attacking similar positions belonging to an enemy, and protecting our commerce, a naval question; while in both cases a certain amount of co-operation from the sister services is necessary to bring about decisive results; that we need not anticipate much difficulty in dealing with an assailant's ships provided we organize our defensive measures liberally and intelligently; and, finally, that the most profitable way of laying out our money in the immediate future is not in any further elaboration of permanent fortification, or in a continuation of the endless struggle for precedence between guns and armor, but rather in the development of frontal fire, the provision of sites for field fortifications in suitable localities, and a sufficient armament of quick-firing guns for defensive purposes, from the proposed intrenched camp round London to the iron and concrete fronts of our great military ports and naval arsenals.

"Let us, above all things, never lose sight of the most salient feature in every scheme of defense, viz., *that armaments are useless without men, and men of little use without training.*"

LETTERS ON INFANTRY.*

BY PRINCE KRAFT ZU HOHENLOHE INGELFINGEN.

Translated by MAJOR N. L. WALFORD, R.A.

III.

CONCERNING VARIOUS OTHER POINTS CONNECTED WITH THE TRAINING
OF THE INDIVIDUAL SOLDIER.

SINCE you encourage me to continue my remarks on the details of instruction, I will run the risk of being wearisome, and pass from the gymnastic exercises to applied gymnastics, *i. e.*, exercises with apparatus and the bayonet exercises. Though in these practices the infantry naturally attach special importance to matters which are useful to them on service, such as climbing, jumping over ditches and the combat with the "arme blanche," yet they do not lose sight of the necessity of a healthy development of all the muscles, and each man derives a lasting benefit from them in the progressive strengthening of his body.

But no instructor of gymnastics escapes from one danger, namely, that of preferring to teach very advanced practices to some peculiarly skilful pupils, rather than to endeavor to push on the most awkward and the most clumsy, and to improve them sufficiently that they may come up to every requirement which can be called for in a good infantry soldier. It is true that at inspections the remarkable performances of some individuals attract attention and gain credit for the instructor, while exercises of ordinary mediocrity pass unobserved. It is true that the division into three classes, gymnastics, jumping and bayonet, are intended, inasmuch as men of the same calibre are placed together, to prevent this danger, but the captain also, who instructs the whole, is easily tempted to take the greatest interest in the exercises of the first of these classes, and to take only a step-motherly care of the others. Many captains even take particular pride in showing a very numerous first class, in which case the performances of individuals in this class will be of very various degrees of excellence.

If the lists of the men in hospital be examined, you will find that a company commanded by such a captain has a very large number of men admitted for accidents at gymnastics. For a man who is passed into a higher class, before he has been properly instructed in the lower, will attempt things beyond his power; for instance, he will fail to jump high enough and will strike the jumping horse, or he will come to the ground awkwardly and sprain his ankle, and so on.

On the other hand, I have seen some companies in which even the most awkward and clumsy men did very satisfactory practice, while but few (2 to 6 men) figured in the first class, and these were soldiers who had already been skilled gymnasts when they joined the regiment. I remem-

* Reprinted, by permission, from Proceedings Royal Artillery Institution (Woolwich).

ber one company, of which all the men climbed out of the windows of the barracks, ran a certain distance over all kinds of obstacles, and finally climbed in again at the windows. In this company there had been no single accident at gymnastics during the whole year, and the men looked in good condition, red-cheeked and jolly. It is true that the captain was an intimate friend of, and had served in the same garrison with the originator (Stocken) of our military gymnastics, and had learnt from him to accustom the muscles first to the easier exercises, and not to go on to the more difficult, until they had gained the necessary suppleness and elasticity. When this is not seen to, it may very well happen that the more difficult practices are clumsily done, while the man hurts himself in doing them. It cannot be too distinctly laid down that each man should be able to do the most elementary and easiest practices with the most absolute excellence and neatness. He who cannot, for example, jump standing with due elasticity, rising off his toes and bringing his body back with his toes and a slight bend of the knees, though he may have enormous strength, so that he can jump across or lengthways over the horse, will, nevertheless, always run a risk of landing on his heels, and of either jarring his spine or spraining his ankle. If gymnastics are taught and carried out in every detail, no accident can ever happen. But if they are unintelligently carried on, accidents will happen, while the men will lose their confidence and will become nervous and disinclined for them. But no man ought ever to be brought into this condition. The more timid he is by nature, the longer must he be allowed to gain confidence by doing the easier exercises, and the more gradually must he be passed on to the more difficult. I have only met with one man in the whole of my service who never could get over his natural nervousness. Before he had been drawn as a recruit his father, a Jew tradesman of my native town, whom I had known from childhood, came to me and urgently begged that his son might be exempted from serving, as he had no courage and would only bring disgrace upon the regiment. As the law did not recognize this want as a reason for exemption, I could not listen to his prayer. At the gymnastic inspection the company finished by running a course over the regulation obstacles, of which the final one was a ditch, which formed a branch of the river Neisse. Young Hopeful came at it last. When he got to the take-off he gave a yell of anguish, threw his rifle with its fixed bayonet into the water, jumped on all fours, and fell like a frog into the ditch, in which he stood covered with slime up to the hips. Amid a roar of laughter from the whole company he waded to the other side. But such an exhibition as this is very rare. It is safe to say that every man who is sound in wind and limb can practise all that is needed for an infantry soldier.

The superior officer who inspects in gymnastics can do very much by the manner in which he inspects. The time that is at the disposal of the inspectors is, as a rule, very short, since they prefer to judge of the different grades of instruction of various bodies of troops on nearly consecutive days, in order that they may have a correct standard of comparison; besides their journeys from one garrison to another take up some little time. A detailed inspection of the drill and musketry generally occupy the morn-

ing, and after as hasty a meal as possible, the tired mind in the tired body turns its attention to the gymnastics. Can we wonder if the inspector then prefers to see the remarkable and more entertaining exercises of the first gymnastic and fencing classes rather than weary himself with the elementary work of the lower classes? But by this the inspector does harm. That which is inspected will be practised, and this is the more true as the period of Peace grows longer; this is the natural consequence in the Army of military obedience, and if the superior officer inspects only the first gymnastic classes, the regiment will neglect the instruction of the others. But the training of the latter is the most important, since it is most necessary to teach every one all that is needful. Such dexterity as goes beyond this is only of value as an incitement, an example, which may rouse less well-endowed men and awaken their desire of honor, and by no means with the object of exhibiting magnificent gymnastic performances before the enemy. But of what use are gymnastics in war? Why should the soldier learn the bayonet exercise when the fire of rifles is decisive? Such questions appear on paper to be reasonable. Yes; even a practical infantry officer of high rank, whose authority no one who knew him would dispute, said to me once, as he watched the men exercising with bayonets and padded jackets: "That is all modern rubbish, in which so much time is spent, that at last the men do not know how to load their rifles in action." He was right. For if the men had not sufficient time to learn how to use their arms properly, because they did so much gymnastics, it would be better to do none, and not even to learn how to fight with the bayonet. What sportsman has not, in the excitement of shooting, made a mistake of some kind, by forgetting to cock his gun or to withdraw the safety-bolt, etc., owing to which the hare has escaped. It is only when he has had such practice in shooting that he carries out mechanically all the needful manipulation without thinking of it, that he can be sure of making no such mistakes. Just so the infantry soldier must be so practised with his arm, that he makes all the necessary motions correctly, by instinct and mechanically, even when his nerves are disturbed by the heat of battle, personal danger, etc. If the practice of gymnastics prevented sufficient time being given to such things, they would be an evil. When I noticed the number of miss-fires on the part of the enemy on the field of battle, when I found muzzle-loading rifles loaded with ten successive cartridges, of which the first was put in hind before (a proof that the soldiers had not noticed that the first shot had missed fire, and had therefore kept on putting in fresh cartridges, one over the other), then I saw how right the above-mentioned infantry officer was, when he said that the firing-exercise should be so well practiced that the soldiers, even in battle, could make no mistake.

We know also that Napoleon I., who of all great captains had the greatest experience of War, laid down as a principle: "The fire-arm is everything, the rest nothing." The value of this maxim must increase with the improvement of the fire-arm. But we do not teach gymnastics in order to show our jumping or activity before the enemy, but in order to strengthen the power of the muscles of the men. With strength grows self confidence, with self-confidence, courage. He who is skilled, knows

it; he who knows it, presses on. We do not teach the bayonet exercise in order that the infantry may rush in on arms of precision with the bayonet alone, as the Austrians did in 1864, with great loss, and in 1866 to their ruin, but we wish to teach it in order that the soldier may not fear a fight with the bayonet, may feel himself secure so long as he has his bayonet on his rifle, and may hold the certainty of victory in his hand. Goetz, in his work "The People in Arms," has brought forward the moral superiority of the offensive in such an overwhelming manner that nothing can be added to what he has said. But the moral effect that is produced by the offensive on a large scale, is, in small actions, the result of a determination to attack with the bayonet. He who determines so to attack gains half the victory, since the enemy seldom waits to receive the assault. But he who has not made up his mind to come at last to the bayonet can never win, for he can have no serious intention to assault. He who does not know how to use his bayonet, will certainly not be determined to finally attack with it, and thus he will never make a serious attack.

However true Napoleon's maxim may be, and though bayonet-fights are rare, yet there were some in the last War. Is a man in this case to use his rifle as a club? Ought he to be exposed to the chance of being unarmed as soon as he has knocked over one enemy, for, certainly, as a rule, the stock will break if he clubs his rifle. After the storming of the forts at Dippel, many rifles were found to be without stocks. When Prince Frederic Charles asked a soldier why he used his butt instead of his bayonet, the man answered: "I don't know; when you get your dander up the thing turns round in your hand of itself." This means that, if the man is more accustomed to strike than to point, he will use his rifle as a club as soon as the excitement overcomes him and nature gets the upper hand. Therefore, it is necessary to make the soldier so accustomed to the bayonet by constant practice in pointing with that weapon, that it becomes natural to him to point; and that he will point, when he is excited, instead of hammering.

When I received my elementary instruction in military knowledge, I was taught that a Frenchman could, by nature, beat a German in a bayonet fight. Involuntarily I formed the idea that in that case the German would be wise to avoid fighting with the bayonet against a Frenchman. Some very sound old officers went so far as to lay down, when arms of precision were introduced, the principle that it was right, when threatened with a bayonet charge, to retire firing from one position to another. Now that I have seen a few battles and many engagements, I know that from such action no other effect can be expected than the loss of the battle.

The principle which was laid down by the most trusted Austrian infantry tacticians, that the only antidote to arms of precision was the bayonet, cost the brave Austrian Infantry much blood in 1864, and became quite untenable in 1866. He who should endeavor, without firing a shot, to cross the whole of the zone which in these days is swept by infantry fire, would certainly be a corpse before he reached the enemy's line. But he who, on the other hand, does not make up his mind at the beginning of an action to go in at the close of the fire-fight, if the enemy will not give

way, until he can see the whites of the eyes of the foe, has no intention of making a real attack, and will not be victorious. Yes; make the intention to charge home apparent, or it will be better not to go into action at all. That sort of thing would remind one of those beautiful strategical manœuvres which concealed the appearance of any intention to give battle, and therefore failed dismally.

I think that I have said enough concerning the necessity of the bayonet exercises for infantry. I do not want every soldier to become a skilled fighter with the bayonet (that we shall never get), but each man should be able, with ease, to give a good, strong point, when a point is needed, and should have obtained confidence that when he does so he will hit his enemy and kill him. The spiritless "clip-clap" which we sometimes hear for half an hour together by the word of command of some stupid N. C. officers is sheer waste of time, and is very like that stage-fight, of which an old, experienced N. C. officer said to his pupils: "I give you my word of honor, you wouldn't pierce a sheet of wet blotting-paper."

The other practical exercises in gymnastics (the practices with apparatus) are only of use to give a man confidence in himself. Even though infantry learnt to jump over wide ditches or to climb walls, yet this will certainly not decide the victory, since it is quite a different thing to jump ditches and climb walls in drill-order and in the barrack square, and to do, after a forced march or a trying bivouac, with a pack on their backs. Moreover, troops which are massed to give the decisive blow, will not find such obstacles all along their front. But the soldier who knows well that he can overcome all obstacles, advances with quite a different feeling of resolution to him whose inward voice cries painfully to him: "Can I get over that ditch, or that hedge," etc. Besides, he who is practised in systematic gymnastics, will jump even the smallest ditch with greater ease than he who has not learnt to jump, and who runs a constant risk of spraining his ankle or straining a sinew. This difference in efficiency becomes more noticeable when the men are tired or are carrying their packs.

At the storming of Le Bourget, on the 30th of October, 1870, during the fight at the church, our grenadiers pressed in through the windows, and jumped twice the height of a man down into the nave. Troops who had not learnt to jump could not do this, even if there were no enemy in the church.

The individual instruction of recruits is in general so capitally carried out in our Infantry that, if I go on to speak of everything, you will say to me: "But what you write about is what I see every day; why, then, should I read it?" while, if you were not an infantryman, all these details would bore you to read. I will not, therefore, enter into every part of this most important portion of our training, but will only speak of some few points, which, to judge by my observation, are worth mentioning.

With the infantry of the Guard, I often saw whole companies with their recruits go out in the winter to practise field exercises, and this only a few weeks after the recruits had joined and long before they had been inspected and been sent to do duty with their companies. In the division which I then commanded, I found this practice more rare. When I had

discovered the object of it, I encouraged the infantry which were under my command to do the same, and the result showed me the advantage of it.

The man who, during the quarter of a year that he remains a recruit, sees nothing but the barrack-square and his barrack-room, and is employed only in the most mechanical and elementary exercises, may easily get into a stolid state of mind and make no further progress. But if he has an opportunity once in the week, either in the morning or in the afternoon, to go out into the open to learn his field exercise, he recovers from the monotony of his elementary training, and gets an approximate idea of his work as a soldier, with a fresh desire to fit himself for it. Such excursions into the open country have as refreshing an effect as have the trips which a master makes with his scholars, when he takes the boys out of the close air of the school-room, and teaches them practical botany. Recruits can be taken out to these field exercises in winter as soon as they have been from a fortnight to three weeks with the colors. They may at first march in rear without arms, and may, during the exercises, stand in close order to mark the position of the supports, while the older soldiers act as skirmishers, patrols, etc. The instructors can then point out to their notice, almost as if it were a game, all the different items of the field exercise, which, taught in theory in their hours of instruction, would take a disproportionate time, since that which he can see has far more interest for any recruit than that which he has to imagine.

You will, perhaps, say that the time now available for the instruction of recruits is already very short, and that it is impossible to take whole mornings and afternoons from the elementary exercises. So I thought at first. But when I inspected the recruits I asked for the daily return of drills, and found that the recruits of the very companies, who had made most of this practice, marched the best at the inspection and showed an excellent discipline at drill. This was because they were not made stupid by doing only recruits' drill. Besides, without the recruits, no company can carry out such practices in the winter, since the guard and fatigue duties of the garrison, in addition to the necessary musketry instruction, take too many of the men belonging to the batches of earlier years, the recruits not being yet available for garrison duty. For these reasons a captain cannot get hold of the older men more than once a week for the purpose of practising the field exercise.

But this is enough; and what a capital time of year it is for these exercises! The snow and the frost enable us to go everywhere, and the occupant of the land cannot claim any damages. It is obvious how superior to a company ordinarily trained will be one which has practised its field exercises ten or twelve times in the winter, at its full strength, during its recruit's quarter of the year.

Another point, which I consider of great importance, is this: our men have to learn, and remember, too, many numbers; so many, indeed, that simple and untrained heads cannot do it. Only think of the regulations of the school of musketry with regard to the height of the sight at different distances. I think we might simplify this. I do not dispute the truth of what the school of musketry lays down, but it is too much for an

uneducated man to remember. I think that it would be sufficient if he knew that when firing at cavalry at 400 metres and under, he is only to use the 400-metre sight, and is always to aim at the feet of the horses; and that when firing at targets representing men at ranges under 400 metres, he is to use only the small leaf, and should aim at their feet. Then the soldier has to think only of the 400-metre sight and the small leaf. He must be taught to follow the command of his officer (section-leader), at ranges above 400 metres. If, however, he has to do with a target representing the bust or the head of a man at short ranges (the only ones at which they ought to be used), I think that, rather than burden his memory with a mass of figures, it would be better, considering how much practice at targets our men had, to teach him to judge instinctively how much below the target he should aim, according as, in proportion to the range, it is more or less distinctly visible.

On other points also their instruction burdens the memory of the soldiers very much; I think too much. I believe that if the instruction were more applied and practical, this might be diminished. We have, it is true, excellent directions for instruction, but I have never yet seen a hand-book which confined itself solely to what the private soldier ought to know; this should be divided into what the recruit has to study, and what the older soldier must be taught. I do not think that you could do greater service to the infantry than by preparing such a hand-book. It would be a long and tiring task, for you must employ an immense time in trying to make it very short.

LETTERS ON ARTILLERY.

By PRINCE KRAFT ZU HOHENLOHE INGELFINGEN.

From the Abridgment of Capt. Toutée.

Translated by Major W. L. HASKIN, U. S. A.

III.

UPON THE EFFICIENCY OF THE FIRE OF FIELD ARTILLERY IN THE CAMPAIGN OF 1866.

THE introduction of rifled cannon in Germany about the year 1850, was not effected without giving rise to numerous objections. The new engines appeared to be too complicated for the rough and heavy work that would be demanded of them on the battle-field.

While commissions accumulated report upon report of their experiments Napoleon III. transformed the French artillery, and the question was definitely settled by the brilliant success of the Lahitte cannon upon the battle-fields of Lombardy.

Before the end of the hostilities the Prussian government had already ordered 300 six-pounder rifled pieces.

The results obtained with these were surprising to those who had only

seen the smooth bore. These last upon a target 50 paces wide, at 1100 yards, demonstrated the truth of the well-known proverb, "The first shot for the devil! the second for *le bon Dieu!* and the third for the service of the King."

The rifled cannon carried farther and more accurately, a heavier projectile, which also had the advantage of bursting. We preserved still three-fourths of our smooth-bores to which we attributed great value in the struggle at short range, but the siege trains received as many of the new pieces as the budget allowed.

This was the state of our armament when the war with Denmark broke out in 1864.

This campaign convinced the most incredulous of the crushing superiority of the rifled cannon over the smooth-bore, and we of the Prussian army even conceived an exaggerated idea of the power of the new artillery, but we saw, later, in the field, and chiefly in the fire upon a moving object, that much of this enthusiasm was without warrant.

Army corps received rifled pieces for ten of their sixteen batteries. This was the proportion decided upon in the United States after five years of war and three changes of material.

The war with Austria, found, then the Prussian artillery fully persuaded that nothing could resist their shells. "They expected to see the Austrian infantry and cavalry disperse before their bursting projectiles as dust flies before the wind."

Colonel von Hohenlohe, who was with the Guard, did not take part in the first combats fought by the Second Army; but certain of the batteries detached from his regiment which took part in these encounters, reported to him that "they had had an affair with an artillery three or four times their superior in number." This kind of a report is not of a happy pre-sage.

On the other side the Austrian cannon did not appear to be very formidable. Thus, at Schweinschædel, a horse battery of smooth-bores advanced to within a thousand paces of sixteen Austrian pieces and with its shrapnel fire forced them to retire.

Hohenlohe and his escort had also the honor to receive the fire of four batteries which saluted them at a distance, called incredible by him, without producing the least effect.

It is upon the field of Kœniggratz that his opinion upon the effects of artillery fire is formed and firmly fixed in his mind. On account of several detachments his regiment had there but two groups of four batteries each, wholly armed with rifles. After a long trot he reached the position of the advanced guard and places his batteries south of Jericek, playing upon the heights of Horenoves. The batteries of the enemy had saluted the Prussian pieces, at the passage of the Trotinka with some shots which were so plunging that they only dug holes in the ground. These projectiles had no other effect than to put in good humor those for whom they were destined.

"The first trial shots showed the distance to be much too great—4000 paces,—and I then pushed the batteries forward to a rise north and close to Horenoves where they opened fire against the enemy's artillery at a distance of 1900 paces. To the right and left of me, other batteries opened fire upon

the same objective until there were 90 pieces playing upon it. The enemy finally stopped firing and disappeared beyond the heights.*

"As soon as the main body of the infantry had passed our line, I accompanied it to reconnoitre the position taken from the enemy before placing my own batteries upon it. In the course of the march one of the Austrian batteries proved to me that it was in no wise annihilated. It suddenly unmasked and fired eight shots successively, three of which burst in the midst of the battalion with which I marched. The rank opened, then re-formed at the command of the officers, and the battalion was not dispersed. This caused me to reflect. The shell of the rifled cannon does not produce the devastating effect that we have been expecting from it,—at least against good infantry."

Arriving upon the enemy's position the General seeks traces of the effect produced by his pieces. He finds neither men nor wounded animals, nor fragments of material—nothing. The batteries of the enemy had quitted their positions upon the formal and reiterated order of Field-marshal Benedek, who deemed them too far to the right. The Prussian artillery had nothing to do with the movement.

"But our batteries came up, received shells which reached them from Chlum, and replied to them. The distance was too great. I, therefore, ordered them to slacken their fire and hastened to the sharp comb of the heights of Maslowed in search of a nearer and more effective position for our batteries. This I found on the hogback which runs down from the Maslowed to Nedelist and at a point about equidistant from the two places.

"I then instructed the adjutant to direct the batteries to come forward to this position to which I proceeded directly to examine the terrain more closely. Meanwhile the enemy's artillery, which I had previously estimated as one or two batteries, had so much increased that the horizon before me, defined by the heights back of Chlum—Nedelist, appeared to be lined with an uninterrupted array of cannon.

"I halted upon the road, which was lined with small trees—saw behind me the first battery (44 pdrs.) coming down from the high tree at Horenowes at a walk because of the steep slope—and observed the enemy.

"They fired one shot. It struck about 100 paces before me in the grain field. Then followed a second shell which went as far beyond me as the first was short. A third shell struck close by me in the rain-soaked soil. Then followed an uncomfortable silence as in the sultriness preceding an eruption.

"I believe that I divined the idea of the enemy. He took me to be the reconnoitering officer of the coming battery in the position selected for it, and now awaited the appearance of the battery which was hidden from him by the hill on which I stood.

"I rode back to the battery and directed the chief that as soon as he reached the crest and saw the enemy fire he should follow me at the most rapid gait possible, without paying any attention to the enemy's fire, and should come into battery when I halted. I then returned to my first position and watched the enemy closely.

"Scarcely had the lead horses of the battery appeared on the height when the whole horizon was wrapped in a cloud of blue smoke and more than a hundred guns commenced a rapid fire with a noise from the explosions and from the screeching of the shells as though hell had broke loose. But at the self-same moment I put spurs to my horse and had already ridden 300 paces nearer the enemy. The battery followed me as quickly as the soft ground permitted. The mass of the enemy's projectiles whistled far over our heads and struck behind us in the road. The enemy, in the

* During the action an Austrian battery defiled in column of pieces between the two lines and all the Prussian pieces immediately fired upon it but without producing the least damage.

thick smoke of his first salvo must have failed to observe that we had run under his fire, for he continued at the same elevation and his shot struck like hail in the same place behind us while we tranquilly obtained the range at 1350 paces. The battery had one man wounded in crossing the dangerous space and suffered no loss afterward.*

"I had at least the one consolation that the enemy, with his new guns, had not yet wholly learned to shoot."

The other batteries followed the movement without great damage, scarcely has each piece fired two shots when the enemy manifests a certain uneasiness. Some of the limbers explode, the firing ceases. We have seen that this result was due to the Prussian skirmishers who, invisible in the grain fields, were within 200 yards of the enemy's line of artillery. A rapid musketry fire, well directed, had prostrated so many teams and cannoneers that a number of the pieces fell into the hands of the victor.

We reached the last position which the artillery of the Guard occupies on this day. It was upon the height south of Chlum.

"I had before me," says the General, "a mark which no cannon, rifled or smooth-bore, could fail to hit. Two Austrian corps were at the foot of the height. Well aligned, closed in masses, facing Sadowa, they presented the right flank to us. The white uniform stood out clearly upon the green ground of the cultivated fields. The right of this mass of battalions, squadrons, and batteries, ranged as upon a checkerboard, was 900 paces from my pieces. Our first shots carried amongst them surprise—fright—disorder. The Austrian infantry which was advancing upon Rosberitz, suspended its attack. Each of our projectiles burst in opening wide lanes in the human mass which moved at our feet. But no one in their ranks thought of taking to flight, on the contrary the enemy undertook a counter attack. A cavalry charge failed at first before a hollow road where our skirmishers were posted; then the Austrian batteries came into action wherever they could find the room necessary for deployment. We were very soon answered by more than a hundred pieces disposed in a semicircle around us. We suffered, then, cruel losses. Many pieces lost teams and cannoneers. Happily the enemy, who was not yet very expert, had taken for a mark the steeple of Chlum 200 yards behind us. Half of the shots strike that building and disembarass us of so much."

This phase of the combat lasted nearly an hour at the end of which the Prussian infantry was forced to retire. The artillery accompanies the movement, for, says Hohenlohe "what I had learned of the results produced by our fire did not warrant me in relying upon it to stop the enemy." Besides the 1st and VIth Prussian Corps acquitted themselves very well of this duty.

The Prince von Hohenlohe had every reason to be satisfied with his batteries. None had failed in their duty. Each had carried itself with honor and in conformity with the orders received and with the regulations in force.

Nevertheless, the results obtained were not at all brilliant and discontent

*This successful stratagem, by which I ran under the enemy's fire had already been practiced by Strotha at the battle of Leipzig where he was required to relieve a disabled Russian battery. From the place where the ruins of this battery lay he ordered a gallop and went 300 paces nearer the enemy. When I saw the colossal silent battery of the enemy at Koeniggratz, this story of Strotha's which he had many years before related to us younger officers during a scientific discussion, shot into my head like a flash of lightning, and I copied it. I mention this solely to show what good fruit may be obtained if the older officers relate their experiences to the younger.

was general in the minds of all. Upon reflection we see that our artillerists were not sufficiently instructed.

Thus many 4 pdr. batteries complain that their shot fell constantly 300 or 400 paces short, attributing this fact to the sinking of the wheels in the ground, while it was due to their breech-sights which, by the effect of the recoil, descended in the grooves at each shot. Whole groups of artillery fired projectiles which did not explode because it had been forgotten to supply the ammunition chests with all the parts of the fuze.*

Hohenlohe kept silent upon the names of these culprits, for said he, their fault is pardonable; we have not had the necessary practice with our material, or rather, we have not yet learned to fire.

Besides, in all the artillery there was no better firing than in the Guard. Of the 200 pieces which were captured by the Prussians not one was dismounted by our projectiles. Nowhere had the artillery obtained decisive results. It had dispersed neither infantry nor cavalry; it had nowhere effected any preparation worthy of the name against the villages or positions which were the objects of attack.

After the campaign, although each felt that he had conscientiously performed his duty, a general uneasiness prevailed, and we sought on all sides the means of assuring to our artillery a real efficiency. Nothing shows this feeling of discontent better than the proposition made in a book under the pseudonym of "Arkolay" to get rid of the rifled artillery altogether and return to the smooth-bore.

As to the Austrian artillery which has often been contrasted with the Prussian, Hohenlohe found that it also had not done all that was expected of it. We have seen it converge the fire of a hundred pieces upon one single battery at 1300 paces without other result than the wounding of one man. It has not once stopped the infantry in its attacks.

"We wish to secure artillery that can shoot sufficiently well to prevent infantry from penetrating the line from the front when it is firing."

Finally, the heroism so much vaunted, which this artillery had shown in sacrificing itself to save the rest of the Army, could well have been imposed upon it by the circumstances already related.

We have seen that the Austrian batteries had been surprised by the Prussian skirmishers and that the unexpected musketry fire which they received had rendered retreat impossible for many of them. These at least could have continued their fire to the last moment. And they did not do so.

In conclusion, and without wishing to diminish in anything the merited glory which both sides have acquired, the general closes by saying that on both sides in 1866 the effect of artillery fire was far from satisfactory.

Wholly otherwise, from this point of view, was it in the campaign of 1870.

* We assembled the percussion fuze only when about to use it. In 1870, even, the Prussians had not entirely broken themselves of leaving out essential parts when in action. Many French officers can remember to have received shells in their batteries without percussion cap, without fuze, and even without bursting charge.

IV.

UPON THE EFFICIENCY OF THE FIRE OF FIELD ARTILLERY IN 1870.

BATTLE OF ST. PRIVAT.—When the Guard Corps moved in close formation from Doncourt upon St. Privat it was fired upon by the batteries of the enemy which occupied the ridge between St. Privat and Amanvillers.

The four batteries of the 1st Division of the Guard entered successively into line as quickly as their column could be deployed.

The Corps artillery prolonged this line, and as each new battery took position, as directed, two hundred paces nearer the enemy than its predecessor, the fire became more and more intense and accurate, so much so that the French batteries withdrew from their advanced position upon the principal line of battle.

This was distant about 2600 paces from the German batteries.

Having then received orders not to advance farther until the left wing of the Army had had time to accomplish its turning operation, these batteries continued the action without farther movement.

"We formed thus," says the General, "a line whose left was some hundred paces in front of St. Ail, and whose right adjoined the Hessian artillery near the Bois de la Cusse. The result of our fire was that at the end of an hour the artillery of the enemy ceased firing and disappeared behind the height of St. Privat which limited the horizon. On this occasion it was not the fire of our infantry which had silenced the hostile artillery; neither was it orders from higher authority, which caused it to withdraw. We have the right to attribute our success to the efficacy of our own fire, an efficacy which prevailed over equal numbers in a position tacitly superior. We had cannonaded the occupants of a dominating position at a range of between 2000 and 3000 paces, and under such conditions, could hardly hope to have destroyed a line that I judged to contain sixty pieces."

The result showed that the French batteries had been but temporarily withdrawn, for when the infantry of the Guard was seen by the enemy at about six o'clock preparing for the assault upon St. Privat, a very vigorous infantry and artillery fire crowned all the height. As soon as the batteries were masked by the assaulting troops, Hohenlohe gave the orders for the Corps artillery and the batteries of the 1st Division to accompany the infantry. This was done, and the six batteries of the left reached the crest of St. Privat, Amanvillers, simultaneously with the skirmishers; seven others, reinforced by two-horse batteries and the Saxon artillery, established themselves upon the infantry line, firing directly upon the walls of the village.

"Prisoners report that the effect of the batteries of the left wing was such that if the attack had been delayed half an hour we would have found the village unoccupied. As to the right wing, I was there personally, and moved forward with the 2d Heavy Battery, Captain Prettwitz, who commanded it, being the first ready to move."

"The battery mounted the hill at a gallop, and three of the pieces took position on the skirmish line, the others having lost horses. The enemy drew in his skirmishers, but four hundred metres before us came dense masses whose object was to drive us from our advanced position. It is difficult to give an exact description of the effect produced upon these

* In War, a position is not changed so quickly as during simple manœuvres. It is always necessary to repack the ammunition chests, to detach dead horses, and to repair or replace many parts of the harness or carriages.

masses by the first shots from Prettwitz' battery. They stopped suddenly as though struck by an electric shock; then the shells were poured in,—pieces—batteries—came to our assistance, and the French turned their backs.

"The possession of the height was very important as we enfiladed the hostile line by Amanvillers, the belfry of whose church was in sight. Our shells reached the Amanvillers quarries, near the Feves woods, and we held under our fire the *debouche* of the route from St. Privat to Metz, as far as the height occupied by the Marengo inn. But it is by this route that St. Privat could receive assistance from Metz."

As for infantry, there was upon the plateau but the six escort companies, and they had lost heavily. The major was severely wounded. The captain in command, himself wounded, gathered some thirty men about his colors. Other little groups were stationed between the batteries to repel the attacks of the enemy by their rapid fire. These dispositions made, the General took position with Capt. Seeger of the 4th battery, who is always successful in obtaining the range, and placing himself behind him, sent his adjutants to inform the other captains of the range obtained.

"The attack of the French infantry came quickly. Dense masses advanced upon us from the position about Amanvillers. When the French were reached by the trial shots fired at the elevation for 1900 paces, the 30 pieces executed a rapid fire, a cloud of smoke hid the hostile infantry, and when it disappeared we discovered the red pantaloons nearer to us. A new trial shot, fired at 1700 paces, marked the distance we should allow them to advance before opening rapid fire; and we continued thus through a series of rapid fires at 1500, 1300, 1100, and 900 paces.

"In spite of the enormous losses caused by our shells, these brave troops continued to advance. But, at 900 paces, the fire became too murderous and they withdrew, followed by our projectiles, until they were hidden from our sight."

This advance, executed by two regiments, furnishes an excellent example of an infantry attack repelled by the fire of artillery only.

Two new attacks of infantry followed the first, but were not pushed with the same energy. They failed at 1500 paces from the German batteries.

The French cavalry also attempted to charge in order to give breath to the defenders of St. Privat. The head of the column appeared near the farm of Marengo, and there halted to serve as the basis for deployment, but after some trial shots a shower of German projectiles fell upon it, and this cavalry dispersed to re-appear no more that day.

"St. Privat having fallen, the other batteries of the Guard rejoined us and took position on the right of the village. The enemy, on his side, deployed against us a line of artillery (the artillery of the Imperial Guard) upon the edge of the woods near the Amanvillers quarries. But the struggle was too unequal. We knew the range and had the advantage of numbers and of position. When night came the French artillery had already retired."

BATTLE OF SEDAN.—Just as the Guard Corps commenced the action, the artillery of the 1st Division had traversed the wood of Villers Cernay by a new road. It found before it a line of French artillery, guns and mitrailleuses which, protected by epaulments, spread death among the Saxons. Established upon the right bank of the Givonne ravine, this artillery offered its flank at a good range to the blows of the Prussian cannon, which

proceeded to profit by the occasion, and three batteries were established at the exit of the road at the very edge of the woods (the fourth could find place only on the left and rear). The effect of this fire was such that several of the enemy's pieces were dismounted, and were abandoned where they lay, where they were captured by the infantry. The Saxon artillery also contributed to this result in a proportion which it is difficult to estimate. But the three batteries of the Guard were themselves in a difficult situation. Besides the return fire, which they received from the batteries they were firing upon, they were enfiladed by the batteries which the French had drawn from their cavalry reserve and established at a point north of the Garenne woods. Hohenlohe opposed to these last the mounted batteries of the Guard Corps. Obligated by the ridges of the ground to prolong toward the north the line already established, the re-enforcing batteries of the Guard were too far from their object, and on account of this circumstance, and of others which rendered observation difficult, their fire was ineffective for a long time.

But the three batteries of the 1st Division, nevertheless, continued their fire, and as this was particularly annoying to the French, they endeavored to advance in order to silence it.

"A battery drawn by gray horses advanced at a trot from the farther end of the village of Givonne in order to take position between that village and the Garenne woods. As soon as it was seen the three batteries directed their fire upon it. It was cut to pieces, the debris remaining in place. It did not fire a single shot. A second battery, then a third, were treated in the same manner."

About this time, toward ten o'clock, the 2d Division of the Guard took in flank the French line which the Saxons were attacking in front, the four batteries of this Division lending their assistance. In what measure the result obtained should be attributed to the Artillery is very difficult to estimate exactly. Certainly the losses of these batteries from the fire of the French infantry show that they fought well to the front. At the extreme right the Corps artillery directed its fire with notable success upon all the objects which presented themselves within its range. A fire at 4000 paces was even executed upon cavalry in column by twos, which showed by its movement the effect of the projectiles. The next day there was found in this place an entire battery. It had entered a hollow road, and the leading horses having been killed, the other pieces were unable to advance, and had been captured by the German skirmishers.

Success so plainly evident excited the zeal and the attention of all, and each surpassed the other in rapidity and precision.

But the result obtained by the Army of the Meuse with its left wing now permitted the Guard to quit its passive fighting, and to assume the most energetic offensive. Its artillery advanced even to decisive combat range. Lining the slopes of the Givonne ravine, and covering all objects with the fire of its 90 guns, it produced the most terrible effects.

Its projectiles carried death and disorder into the right flank of Granchamp's Division, with which General Wimpfen attempted to break through our line. French troops appeared at other points, but nearly all the bat-

teries brought a converging fire upon them as soon as they showed themselves.

"The ruin produced by our fire presented a frightful spectacle; the cries of the wounded reached even to our position."

The wood of Garenne furnished the last point of support to the French, and the 1st Division of infantry of the Guard was designated to drive them out, while to the artillery was assigned the task of preparing the way for the attack. For this purpose the General divided the edge of the woods into a certain number of sections, to each of which was assigned one battery. The first piece of each battery was to fire upon the very edge of the woods, and the pieces following were to fire in the same direction, but with an elevation increasing by 100 paces from one to the other.

This order was punctually executed.

"Such was our superiority over the enemy that the fire was executed more as if on the exercise ground than in actual combat. As at practice firing there were spectators, officers of the troops in reserve, doctors—even a chaplain."

This preparation was persevered in without other incident than a change of object due to a counter attack by the French troops.

When the preparation was deemed sufficient the orders for the assault were given. One general salvo of all the pieces served as a signal. This was fired at exactly half-past two o'clock, and the infantry advanced from Givonne to climb the height. Every one watched with anxiety the edge of the woods, for the memory of St. Privat was fresh in mind. But here the resistance was almost nothing. The French, discouraged, surrendered upon all sides, avowing that the fire of the Prussian artillery had crushed them. The Guard Corps made this day from 11,000 to 14,000 prisoners not wounded, and had but 12 officers and 320 men disabled.

Their figures speak for themselves, and show how a judicious employment of artillery can save the infantry from loss.

BATTLE OF VIONVILLE, MARS-LA-TOUR.—General Hohenlohe gives the following extracts from a letter written by Gen. Von Dresky who commanded, as colonel, the artillery of the III^d Corps:

"I had caused the two-horse batteries to take position," says Gen. Dresky, "when Gen. Von Bulow gave me orders to occupy with the Corps artillery the height which runs from east to west, south of Flavigny. At the same time Gen. Alvensleben notified me that I would form the centre of the position, and that he counted upon me to hold it solidly. The batteries limbered up, but they had before them a deep marshy ditch which extended from Flavigny toward the west. I set out with all speed to reconnoitre a passage. At Tantelainville I found a bridge beyond which an immediate ascent commenced which conducted to the position indicated to me. In crossing this bridge I did not allow the possibility of its being under fire to render me uneasy. I estimated that the bridge was 1600 paces from Flavigny, and I did not think the passage dangerous, but scarcely was the head of the column ready to cross it when it received from Flavigny a sudden fusillade which stopped the first piece. A lieutenant, a trumpeter, three men and six horses fell. The other pieces crossed the bridge at a gallop and found shelter behind the hill. They formed there without other damage. The disabled piece was very soon put in order and rejoined its battery without hindrance, although the infantry at Flavigny did not cease firing.

"The two-horse batteries began by causing the evacuation of Flavigny, and as the French withdrew I advanced by a march in echelon and followed them with my projectiles with visible effect. The mounted batteries coming up in their turn I moved forward by echelons. By two o'clock I had my batteries on the heights of Flavigny, two on the north and two south of the village. I remained there until seven o'clock in the evening. When, toward five o'clock, the vigorous attack of the Imperial Guard took place, there were upon this position seven mounted batteries and four horse batteries. For a half hour ten batteries cannonaded us; then came the turn of the French infantry, which advanced to the attack. We could distinguish but a thick line of skirmishers, and this line we took for our object. As we had been in position since two o'clock we knew the distance to numerous landmarks, so that our projectiles made terrible havoc in the enemy's ranks. After having marched very gallantly to within 1000 paces, and having executed a fire, rapid but without effect, this infantry faced about and retired.

"I have from this occasion acquired the conviction that *a line of artillery is unassailable upon its front*. Since 1870 the improvement in armament has only strengthened this belief. A strong line of artillery fills so well the office of an impregnable rampart, that masses of broken or unsuccessful infantry may come behind for cover while re-forming.

"The artillery of the Corps lost on this day 10 officers, 119 men, and 249 horses."

COMBAT OF CHILLEURS-AU-BOIS.—The same Gen. Dresky took part on the third of December in the combat of Chilleurs-au-Bois, which was very interesting from an artillery point of view.

The III^d Corps was about to march to the attack of the French position, the 5th Division on the east, and the 6th Division on the west of the road from Pithivers to Orleans. "I had to make," says Gen. Dresky, "a long flank march with the Corps artillery, and to pass around the village of La Brosse in order to reach the position which I had chosen. My batteries, in column of carriages, were cannonaded during all this march, but we suffered no loss. The horse artillery took position at La Brosse and the little wood situated south-east of the village. The mounted artillery was placed south of this position.

"But it must have been that the enemy had ascertained in advance the range of the position occupied by our horse batteries, for their first shots struck in the batteries and caused cruel losses.

"Nevertheless, as soon as the mounted batteries had opened their fire, the French batteries (at Santeau) withdrew into a sheltered position between the mill of Epine and Chilleurs. They maintained their position there for some time and then disappeared.

"I then crossed the railway in echelon by battery and advanced within 2000 paces of Chilleurs to cannonade the village. The enemy did not await the advance of our infantry but quitted his position. This gave occasion for the 4th Light Battery to cannonade a column of infantry, and this was done with such success that the column was dispersed.

"The next day I visited on horseback the position that the enemy had held. We had not dismounted any of his pieces, but a great number of artillerymen and of killed and wounded horses remained near the mill of Epine as witnesses of the effect produced by our fire.

"At the place where the column passed which was fired upon by the 4th Light Battery we found more than 20 dead, of whom many were lying one upon the other.

"The loss which the French artillery had inflicted upon us was as follows:

"Infantry and Cavalry, 2 officers, 57 men, and 14 horses.

"Artillery - - - 4 officers, 39 men, and 54 horses."

This letter of Gen. Dresky again shows the progress accomplished by the artillery since 1866 in that which concerns the fire upon columns in march.

General Hohenlohe relates the following incident of this combat:

"As I saw the enemy's infantry withdraw from Chilleurs I gave the general order for the batteries to open upon it, and rode to the 4th Light Battery, whose chief, Captain Mueller, had attended the school of firing and understood the principles there taught. Addressing the men I said, 'For each shot that you drop into the enemy's infantry I will pay you 3 thalers.' A cannoneer replied, 'Herr Colonel, that shall cost you dearly, we shoot very well.' The first shot went over, the second struck short, and then followed seven shots, one after the other, which accomplished the complete dissolution of the column. Amid the general rejoicings of the battery I paid my 21 thalers."

CAVALRY:—A REVIEW.

By CAPTAIN J. M. GRIERSON, R.A.

(From Proceedings Royal Artillery Institution.)

TO thoroughly appreciate Prince Kraft's letters upon cavalry, they should be read before those upon artillery and infantry, since as the author himself states, he takes more a bird's-eye view of cavalry matters, and the letters are consequently wanting in that strong element of personal experience, and enthusiasm for his own branch of the service, which are such distinguishing features, and which form so great a charm in that work which may be looked upon as a golden book for gunners—the "Letters upon Artillery." Still, Prince Kraft for seven years commanded a division of all arms, and had constantly to conduct detailed inspections of cavalry, and this fact alone, independently of his great experience in War, gives him every right to be heard on this subject. And all the more welcome should Prince Kraft's work on cavalry be to the artillery officers of the world, since it gives one more proof—if more be required—that, given practical experience in working with other arms, there is nothing to prevent artillery officers commanding, and intelligently commanding bodies of troops of all arms, and that, without laying themselves open to the imputation of exalting their own arms at the expense of others. In no army has this keeping artillery officers in the background been more pronounced than in the Prussian, where as stated by a writer in the *Allgemein-Militär-Zeitung* of 3d April, 1886, during a long career, he can call to mind only two artillery officers who have commanded mixed divisions, and in which at present, so far as we can make out, not one artillery general commands an Army Corps. Prince Kraft has shown the falseness of this system, and the thanks of the artillery in general are due to him for it.

In the first eight letters, the Prince reviews the conduct of the German cavalry in the three campaigns in which he has taken part, and points out that the best results have been attained when the cavalry worked in complete harmony with the infantry—the principal arm always—and subordi-

nated its action to that of the latter. As neither of the three arms can work independently, cavalry, therefore, may be said to have had as much share in the successes of those wars as the other arms, only its field of action has been curtailed by the precision of modern fire-arms, which limit the sphere of activity of the horsemen to such objects as can be attained by speed. In many cases in those wars the action of cavalry was limited by other causes. During the Franco-German War, a successful pursuit was seldom made, after a battle, by the German cavalry, but many critics seem to forget that when the retreat of a defeated army is covered by fortresses, a direct pursuit is impossible, as no one has yet presumed cavalry to be capable of taking such works unaided, and in the later battles of the campaign, the frozen state of the roads made cavalry action next to impossible.

Putting aside the isolated cases of action on the battle-field, the principal part of the renown gained by the German cavalry in the War of 1870-1, was due to the admirable manner in which it performed the screening and scouting service in front of the Army, and the official account speaks of the clear, reliable reports of the numerous German cavalry, upon which decisive action was taken by the "Head-Quarter's Staff." The name "Reserve Cavalry" had been done away with as in the case of the artillery. It naturally led to false conclusions in regard to its use, and the cavalry, not incorporated in the infantry divisions, was organized as independent cavalry divisions, which covered the front with an impenetrable veil, spied out the movements of the enemy, and enabled the column of its own army to move with comfort and safety. At first, indeed, the German cavalry seemed to have some doubts as to its proper functions, and the retention of the 4th Cavalry Division in rear of the IIIrd Army on the 6th August, and the consequent loss of touch with MacMahon's Army have been severely criticised, but Prince Kraft points out that the Germans were then in ignorance of what masses of troops were in rear of the 1st French Corps, and hesitated to risk a cavalry division far to the front. Mistake or no mistake, however, the German cavalry nobly redeemed its reputation on subsequent occasions, and its rapid advance to the Moselle, and the consequent paralyzation of the French plan of operations, contributed not a little to the success of the German operations. On the battle-field, too, the German troopers showed themselves in no whit inferior to their forefathers of the Seven-years' War, although here also critics have had their faults to find.

Almost universally, Bredow is blamed for having charged at Mars-la-Tour without a support. The check suffered by the French would undoubtedly have been greater had he been followed by such a body, but, as a matter of fact, none such was available. Time was precious, the situation critical, Bredow had to be devoted to destruction to save the Army, and it was only with the greatest difficulty that a single cavalry regiment, the 11th Hussars, was got together to rally the remnant of his brigade, as the whole of the remaining 68 squadrons then with the Army were employed in guarding the flanks of, or acting as support to, the hard-pressed infantry, then extended in one long, thin line. And after all, at what price was the success gained? Only 409 horses were offered up to save the centre of the Army! Again, the 1st Guard Dragoons, by the loss of 250 horses, saved

an entire (Wedell's) Brigade! Surely such losses were not out of proportion to the results attained.

To the divisional cavalry, Prince Kraft also gives their share of praise, and speaks of the glad feeling he experienced when at St. Privat his guns came into position to attack St. Marie aux Chines, their left flank towards St. Ail, being exposed apparently to the attack of French infantrymen issuing from St. Marie, on riding forward, he found the whole of the Guard Hussars drawn up in a hollow between his guns and the enemy, and only waiting a chance to beat the latter. Many examples says the Prince, might be adduced to show the enormous services rendered by the patrols of the divisional cavalry on the field of battle. Those brave horsemen rode up to the enemy's position, and brought back sure and reliable reports of his numbers and dispositions. Next, perhaps, to the advantage gained for German Head-Quarters by the reliable information brought them by their cavalry of the enemy's movements, may be placed the advantage gained by the German infantry in having their strength spared by the cavalry screen. The worst cantonment is better than the best bivouac, and, protected by their cavalry divisions, the infantry columns could rest in peace and comfort in cantonments, without fear of night alarms. Even when in such close contact with the enemy as on the 28th August, the entire Prussian Guard Corps, trusting in their advance cavalry, were placed in cantonments.

Before 1866, many voices were raised to prove that rifled fire-arms had driven cavalry off the battle-field, but Custozza, Königgratz (attack of the 1st Squadron, 10th Prussian Hussars), and Mars-la-Tour serve to show that cavalry well-handled, and with a leader who knows how to seize his opportunity can still have a word to say in the result. Wörth, Vionville (charge of the French Guard Cuirassiers), and Sedan, are examples on the other hand of how not to do it. In future, therefore, we may still expect to see cavalry, aye, and masses of cavalry, on the battle-field. Their action will usually be from the flanks, as by attacks from the centre of the line they mask the fire of their own side. Prince Kraft tells how the 6th Prussian Division was just beginning to retire before the fearful fire from the French positions round Vionville, when suddenly this fire ceased. The Prussians at once halted, amazed at their escape, and discovered the cause to be the attack of the French Guard Cuirassiers! This they soon disposed of, but the momentary relief from the heavy fire was all they required to enable them to hold their position. Cavalry will often in action have chances of approaching unhurt to troops engaged with their own side—e. g., a hostile artillery mass engaged with their own infantry and artillery—and such are very favorable if the ground permits of anything like a covered approach.

In general, in future, cavalry action will be much the same as in the War of 1870—at least it will be conducted on much the same principles, for no country can again hope to have the good fortune of the Germans in being opposed by a cavalry unworthy of the name in all but personal gallantry. The cavalry divisions will be pushed one to three days' march to the front of the Army, and in future will be much more independent on account of the general introduction of rifled carbines, and the larger number of guns attached to each division. Whether, however, the Russians have done wisely in

changing *all* their cavalry into dragoons, armed with rifle and bayonet, remains to be seen.

In the 9th and 10th letters, Prince Kraft considers the question of cavalry raids, and first replies to the critics who blame the German cavalry for not having made such in 1870. There is much that is poetical, much that is enchanting about the idea of a cavalry raid; but from the sublime to the ridiculous is only a step, and when the question comes to be examined practically, these raids would appear to have been next to impossible, and, at all events, too costly. The principal period during which, say the critics, raids should have been made by the German cavalry was that when the armies were being formed by Gambetta. The laying waste of large tracts of country being put out of the question by the conditions of modern civilized warfare, there remain but two classes to be dealt with, those with a general roving commission, and those with a distinct object. Had a German cavalry division been pushed among Gambetta's armies, with a general order to impede mobilization, it would doubtless have cut off a large number of stragglers, broken up a battalion or two, and frightened a few old women of both sexes, but once it came upon a formed body of troops, it must at once have given way. A division of six regiments could only put 1400 carbines into the shooting line, and in a difficult, cut-up country like that round Orleans, Rouen, etc., what chance would these have had against even a battalion of infantry decently well posted? Would the loss of a cavalry division have been equivalent to the damage thus done? There only remain raids against certain objects, such as important centres of mobilization (Bourges, Le Mans), or the seat of government (Tours). But these were far distant; the approach of the cavalry would have been announced by telegraph, and troops gathered, both sufficient for their defence against the small force of a cavalry division and to cut off the retreat of the detachment. A cavalry division undertaking a raid to such a distance would have to be accompanied by a certain amount of trains, and a body so constituted could not save itself across country, nor cross rivers with its guns, etc.

Such a raid was actually attempted by the 4th Cavalry Division on the 25th September, but at Chevilly it was met by infantry who forced it to retire with loss. As the official account says, "An isolated advance of a mass of cavalry in this difficult country appeared unadvisable," and the division had to return to Toury and Pithiviers. As a matter of fact, numerous as were the German horsemen, none could be spared for such dare-devil ventures; all were required to watch the French armies, which were advancing against the weak forces covering the siege of Paris, whose only hope of success lay in good information and rapid concentration.

Passing now to the future, the raids in the earlier period of mobilization, about which so much has lately been written, appear to Prince Kraft to be open to precisely the same objections as those stated above. It appears to be forgotten that the conditions obtaining in America during the Civil War are not likely to be repeated in European warfare. Firstly, the whole South was not hostile, and in every village a raiding party could count on finding sympathizers, if not friends. Their supplies would there-

fore be assured, and their wounded and sick cared for. In addition, the extensive woods allowed of movements for long distances being made unobserved, a condition which is totally wanting in Europe, thickly populated and well provided with communications as most parts are. Such raids would, therefore, only succeed in cutting off isolated men hastening to join the columns, or, at the most, breaking up a battalion or two. The important points, large cities, detraining stations, etc., would generally be protected by troops; and even against a few infantry, what could an isolated body of 2000 horsemen, far from supports, hope to effect? No, says Prince Kraft; better keep the Cavalry Division for the real work of War, and confine such raids to small patrols, sent to destroy railways, break telegraph lines, etc., as was done by the German cavalry in 1870—a work which can be equally well done by small parties, whose loss would not be felt. These are more mobile, better able to support and conceal themselves, and, therefore, more likely to succeed than larger masses.

Passing now from strategical and tactical questions to those of more purely cavalry interest, in his 11th letter the author points out the difficulties with which cavalry officers have to contend. Increased demands have lately been made upon cavalry, long distances must now be traversed at the quickest pace, patrols sent out to hitherto unheard of distances. Musketry instruction is imperative. Every horse must now leave the ranks at the rider's will, and carry him straight across country. All this involves an enormous increase of cavalry officer's work. The difficulty is to discover *juste milieu* to which the instruction may be carried, for a surfeit of work is apt to render both men and horses languid, and tax their strength too far.

It is not only in the matter of instruction that the cavalry officer has his difficulties to contend with. The drill of his arm is necessarily now so quick that his mind must be made up at once, and his decisions taken with hardly a moment's consideration. In the infantry a wrong order can be canceled, a mistaken movement corrected, but in the cavalry never. The squadrons once launched, the control passes from the hands of the commander into those of the inferior leaders, pace, noise and dust prevent all correction. Thus, a cavalry officer's reputation, aye, his honor, hangs often by a single silken thread—a single thought—a single order! To the above may be added *par parenthèse*, that a cavalry officer undergoes much more bodily exertion than his brother of the infantry, and that his pocket is more heavily touched.

As to the performance to be expected from the cavalry of the present day, Prince Kraft lays down in his 12th letter, that a squadron must be able to traverse a German mile ($7\frac{1}{2}$ kilometres) at a quick pace (trot and gallop) and make an attack at the end of it; that selected horses must be able to traverse 80 to 100 kilometres in a day, as would be required from them when forming part of officers' patrols; that the officers destined to lead these patrols should be so prepared as to make such reports on the enemy and country as would enable Headquarters to base their plans upon them; and that masses of cavalry should be able to march 45 to 50 kilometres a day for three days in succession. The first three points are already provided for in the programme of instruction of the German cavalry, but

the last is a point to which little attention has, thus far, been paid. Yet a great deal of practice is necessary to ensure the proper execution of these marches. First, practice is required in the choice of *rendezvous*.

Nothing tries cavalry more than long waiting on horseback. The body to *rendezvous* at one point should be, therefore, as small as possible, and all measures taken to enable the various units to dovetail into the line of march, or move off in proper time on parallel roads. Secondly, practice is required in giving precise and clear orders from the saddle, forgetting nothing, especially in the matter of letting scouts and advance guards get a certain distance in front. Lastly, excessive care is required in choosing the pace at which columns are to move. From experience, Prince Kraft recommends, as an example, on a march of 50 kilometres, first, half an hour's walk, then, in succession, half a (German) mile's trot, half hour's walk, mile trot, half hour's walk and half mile trot, making in all, with a half hour's halt, four German miles or 30 kilometres in three or four hours. A halt of two or three hours should then follow, during which the horses are to be watered and fed and the men given a meal, after which the remaining 20 kilometres may be traversed in three hours. Thus, the whole march should take at the outside ten hours, a space of time not too great for a forced march. To practice such movements in peace, Prince Kraft recommends manœuvres of two cavalry divisions placed 5 marches apart. Each could advance for two days driving a marked enemy before it, and on the third day the divisions could manœuvre against one another. A day of rest should then follow, then two days of manœuvres, then a day of rest, and then the divisions should each retire on their own districts before a marked enemy, the whole exercise thus lasting ten days. Far from separating the cavalry manœuvres from those of the infantry, Prince Kraft considers that it is of the utmost importance that the cavalry should take part in the manœuvres of all arms, and that the exercises sketched above should take place after the grand manœuvres, the extra expense, caused by the cavalry recruits being kept ten days longer with the standard than those of the infantry with the colors, being infinitesimal compared with the advantages gained.

The 13th (detailed instruction), 14th (squadron training), 15th (field service), and 16th (drill in large bodies) letters apply more particularly to the German cavalry, and before entering upon these matters, Prince Kraft apologizes for abandoning his bird's-eye attitude and descending to matters of detail, but excuses himself by saying that in his seven years' experience as a Divisional Commander he has noticed many such matters in his inspections, and will only mention the results he has observed to be attained by different methods. With one exception, we do not propose to enter into detail of those letters, firstly, because they apply more specially to cavalry matters, pure and simple, and, secondly, because we observe that a large number of Prince Kraft's suggestions, especially in letters 15 and 16, have been adopted in the new German Cavalry Regulations of 10th April, 1886. The one exception is the mode of inspecting a squadron. Instead of ordering a squadron to be ready for inspection formed upon the drill ground, in which case it was certain to be there before the time fixed,

thereby wearying the men and horses, and losing time, Prince Kraft's method was to order the men to be standing to their horses in the stables, ready to turn out. He inspected them there, and then ordered the turn out. Directly the squadron was formed up, he again inspected it, and on the march to the drill ground advanced guards, etc., were practised, thus having all the time actually on the drill ground free for drill. If two squadrons were inspected together, one retired before the other to the drill ground, and generally manœuvred against it when on the latter. To cavalry officers these four letters must be particularly interesting, and to British cavalry officers—after their own admirable regulations have, as the Germans say, "gone over into their flesh and blood"—we might add that many useful hints will be found in the regulations quoted above.

The 17th letter deals with the question whether permanent cavalry divisions should be organized in Peace, and of such a course the author pronounces himself a decided opponent. In War there are two positions in which a cavalry regiment finds itself, as the regiment attached to an infantry division, or as part of a brigade in an independent cavalry division. To make the peace organization correspond with the order of battle in War, divisional cavalry would have to be organized in Peace, and hence would insure a separation into two parts of the cavalry, which could not fail to be detrimental to those regiments detailed as divisional cavalry. The duties of all cavalry regiments are the same, within their own spheres in War, and, therefore, their training should be perfectly uniform in Peace. A further objection in Germany to the formation of independent cavalry divisions in Peace is, that only two corps (the Guard and 15th) have eight cavalry regiments, the others having from four to six. If two divisional cavalry regiments were told off to each army corps, the remaining regiments of two or more corps would have to be united to make up cavalry divisions of six regiments, thus breaking up the strictly territorial system on which the German Army organization is based. To this objection some writers have proposed that the cavalry divisions should be disassociated from the army corps, and placed under a special Inspector-General; but this, the Prince points out, would tend to weaken that close bond of union which should exist between all arms of the Service, and he remarks that it is curious that while the field artillery are doing their utmost to strengthen the ties between themselves and the rest of the Army, the cavalry should aspire to separation. He, therefore, considers the present organization the best, and holds that although on mobilization cavalry divisions meet for the first time, in a few days all settle down into their places, and that with a perfectly uniform system of training there should be no friction. The Prince has some interesting remarks to make in the next letter on the subject of cavalry working with infantry. His opinion of the great advantage gained by the infantry and artillery in having the divisional cavalry so intimately associated with them on the field of battle, has been recorded above. Infantry is the principal arm—*die Hauptwaffe*—and, therefore, the cavalry should have to make its action fit in with and aid that of the infantry. For this purpose all the cavalry of an army corps should invariably take part in the corps or divisional manœuvres, the special cavalry

manceuvres recommended by the Prince taking place *after* the manoeuvres of all arms. The remarks made as to "putting troops out of action" in manoeuvres are full of practical sense. No good is gained by making cavalry dismount and consider themselves *hors de combat* for a longer or shorter period. All ranks feel it as a disgrace, and if cavalry are always to be put out of action on charging infantry, as generally happens, they will soon get to think that such attacks are impossible, and the *Reitergrist* will be impaired. "Therefore," says the Prince, "the less putting out of action there is the better, and it is better to adjudge neither side as victors, but to make both retire. The only exception should be when one side has committed a fault, such as letting itself be surprised, and in this case putting out of action is a punishment."

The author is no great friend to cavalry fighting on foot. He shows that in a cavalry division of 24 squadrons of 60 files, the cuirassier regiment would probably be kept as mounted reserve, as the idea of a cuirassier, with his armor and jack-boots, crawling on his belly through a potato field, is slightly ridiculous, while two squadrons of a light regiment would be retained as mounted scouts. There would remain 18 squadrons, which would give about 80 dismounted men each, or a total of 1440, provided with 20 rounds of ammunition each. Now, what could such a force effect? A battalion of 700 or 800 well-posted infantry would probably cause them enormous loss—such loss as to render the division useless—and would certainly repulse the attack. Far better, says the Prince, to manoeuvre on horseback, gain the flanks and rear of the enemy, and so paralyze his action. The offensive action, on foot, of an entire cavalry division is, therefore, the author thinks, a case which will seldom, or never occur, and the only probable cases of cavalry acting in this manner will be when it is necessary to drive off bands of armed inhabitants, *franc tireurs*, or small bodies of troops. On the defensive, however, the case is different, and as examples of the services cavalry may render in this event, Prince Kraft cites the defence of the Kanin-Chenberg at Forbach by Dulac's Dragoons, and the holding of Dieulouard by the Prussian Guard Dragoons against French infantry.

The 20th and last letter is devoted to the question of the proportion of horse-artillery to be attached to a cavalry division, and the remarks made are not applicable all round to British circumstances on account of the difference of our organization. At first it would appear that one battery would suffice for a cavalry division, but as a division may be broken up into brigades, it is evident that more than one battery should be provided. No arm, says Prince Kraft, more requires the constant presence of the (company, squadron, or) battery commander than the artillery. Now, the place of the officer commanding the artillery attached to a cavalry force is with the commander of the force, so that he may at once be made acquainted with his designs, and take his own measures for supporting them. If he is also a battery commander, he cannot, therefore, be with his battery. The proper force of horse-artillery to have with a cavalry division is, therefore, an *Abtheilung* (3 batteries), commanded by a field officer, who has an adjutant. This force may seem excessive, but often detached brigades

have to be provided with batteries, and it must be remembered that on the day of battle the batteries of the cavalry division join the nearest masses of guns. Other causes also plead for horse-artillery *Abtheilungen* taking the field as a body. No other arm of the Service is broken up on mobilization. No cavalry regiment detaches one squadron to another army corps or division, and why should horse-artillery detach batteries? Each *Abtheilung* has also a paymaster, and how can he look after the accounts of a detached battery? All these reasons seem to claim that an *Abtheilung* should take the field complete. There is one more reason why this should be the case.

Experience has proved that, if a battery is detached and has no officer of standing at divisional headquarters to represent its interests, etc., it gets a scant share of the decorations and rewards which fall to the lot of its better represented comrades of other arms. It may be the fashion to affect to despise decorations and orders, and to say that the knowledge of having done his duty should be enough for any soldier, but as a matter of fact, men like some recognition of their duty having been well performed, and the prospect of a decoration is a great incentive to extra exertion. A battery without a representative on the staff of a division is in great danger of being, unintentionally, of course, overlooked, and nothing is more galling to soldiers, who, after all, are human beings, and, as such, capable of feeling, than the consciousness of services, which they know to have been good, being overlooked for want of proper representation.

Therefore, says the author, *an artillery officer is required on the staff of a division in a position to make his voice heard.*

Verily, Prince Kraft understands men, and his words are golden.

Military Notes.

RUSSIAN INFANTRY TACTICS.

CAPTAIN C. A'COURT, Rifle Brigade, gives, in the 146th No. of the *Journal of the Royal United Service Institution*, an excellent account of "Russian Infantry Tactics," and the "Manuals" of General Dragomirov amplifying these.

"Dragomirov, by the brilliancy of his writings, by the great common sense that pervades all his work, and the intensely Russian vein of his humor, by the masterly manner in which he has explained and developed Souvorov's teachings, appears to be not only the best of the Russian military writers, but a man unsurpassed in the difficult task of military criticism and explanation.

"That Souvorov is great, and that Dragomirov is his prophet, sums up the opinion of nine-tenths of thinking Russians."

Under the head of "Ammunition Supply in the Field," the author states: Few questions affect more vitally the efficiency of infantry in battle than the sound organization of the supply of ammunition. During the War of 1877, neither the regimental carts nor the flying packs could be depended on to replenish rapidly the ammunition carried by the men, and in consequence from 90 to 105 rounds were served out before an action, this too for men armed with a short ranging weapon and trained to reserve their fire. Skobelev was even in favor of a larger number, and declared that 130 rounds were necessary to keep up a fight. The question attracted much attention in Russia and elsewhere after the last war, and divided authorities into two opposing camps. The first, headed by the Skobelev, wished to make the men themselves carry the needed supply for action; the other, with General Zeddeler as chief exponent, was anxious to lighten the burden of the soldier as much as possible, but to place an ample supply of ammunition within his reach by sound organization of transport, and by methodical distribution during a fight. The latter views prevailed, nor does there seem much doubt that the essential thing now is to organize the ammunition columns with care, so that what they contain, whether 20, 40 or 100 rounds a man, may be readily accessible and within reach of troops; this is the main point, the number of rounds carried by the wagons is almost a secondary consideration. In order, then, to make sure of success in a matter where formerly failure had been the rule, a number of exhaustive experiments were undertaken with a variety of carts and wagons proposed for regimental supply, while several methods proposed to meet the difficulties of distribution were tried in the field. Without entering into details

of these trials, the general conclusion may be mentioned, namely, that two-wheeled carts form the best means of transport, and that these should be supplemented by pack animals in hilly country. As for the distribution, there was a general consensus of opinion that no system could prove satisfactory unless men were regularly trained to the work, and the duty established on a regular basis, like any other service. The instructions drawn up after these experiments lasted for some time, until they were modified by the Regulations of June, 1886, about to be described.

In accordance with the recent organization of the regimental train, the supply of ammunition of an infantry regiment, in addition to the rounds carried by the men, amounts to 153,504 rounds, or 48 per man for the 3,200 men in the regiment armed with rifles. These are contained by 553 zinc-lined cases, which are carried in 33 two-wheeled carts, namely, 16 company and 17 regimental carts. The regimental train forms two groups, of which the first marches immediately in rear of the fighting body, and the remainder at the tail of the column; 8 company carts march in the first group, and the rest with the regimental reserve.

The Regulations of June, 1886, begin by noticing the formations assumed by the carts when troops leave the column of march. It is laid down that in this case the first group of carts should form up in one or two lines, 20 paces in rear of their troops. When the troops pass from reserve to fighting formations the officers commanding the several units give general instructions with regard to the positions and movements of the carts, in accordance with conditions of ground and the exigencies of the fight. In open ground the carts must not be more distant than the regimental reserve or third line of troops; if there is cover they may come up to the battalions in second line, or even in rear of the companies of the battalion reserve in first line. The arms officer is required to keep his cart as much as possible out of fire; while following out his instructions, he keeps his chief informed of his movements and position, and this officer informs in turn his subordinates. The carts have to follow the ebb and flow of the fight, and the arms officer is often called upon to take important decisions upon his sole responsibility. When the carts are distributed among the companies, a N. C. O. is in charge of each section of carts; the position of the carts is marked by a red flag in the day and a green lantern at night.

If ammunition cannot be brought up during an action from any cause, the troops may call upon their supports in rear for a fresh supply, and these, in turn, upon the reserves; rounds of the killed and wounded are also collected.

A body of troops requiring a fresh supply sends two or three men to the chief of the unit, from which ammunition is demanded; half the supply of the latter is given over, and men told off to carry it. If the supply is drawn from the carts it is carried up either in the zinc-lined cases or in bags, which form part of the equipment of the cart. Every request for ammunition is to be immediately complied with, from whatever body of troops it may come. The carts are filled up from the second group of carts, at the head of which march the eight remaining company carts.

This group is supposed to form up 500 paces in rear of the first group,

but it will probably be seldom able to do so. Experience shows that once an ammunition column is separated from its fighting troops by being placed, as the Russian second group of company carts and regimental reserve are placed, at the tail of a column, the chances are against the happy discovery of this supply by the troops concerned at the crisis of the action; the train is looked upon as so much lumber by anxious combatants pressing on to the front; it gets pushed on one side, and as every road is covered with marching columns, the chances are decidedly against the reserve ammunition reaching the troops for whom it is intended.

MAGAZINE RIFLES.

In one way the question of ammunition affects Russia less vitally than her neighbors, for in the matter of repeating rifles Russia hangs back from following the lead set by Germany. Russia has weighty reasons for this determination, and one cannot but admit that her refusal to abandon a rifle of proved use on the battle-field for an untried arm, notoriously defective in many technical details, is a decision to be treated with respect.

Since, on the other hand, the great military neighbor of Russia has definitely adopted the repeating rifle, known as the 1871-'84 pattern, it becomes a matter of interest to inquire what this rifle is, what the tactical consequence of its adoption will be, and what reasons, other than purely financial ones, the Russians can adduce in support of their conservatism.

It may be said that the new German rifle is essentially a cumbersome arm, as anyone can judge for himself by inspecting the pattern at the Royal United Service Institution, and, although no parts of the old rifle can be used in its manufacture, the new weapon is still essentially the 1871 rifle—neither the ballistic virtues nor the weight of the ammunition being changed, the arm being merely modified in a few details and provided with a magazine. The infantry field-exercise book has been very slightly altered to suit the new arm, and the old regulation, namely, that "in all volleys, more importance must be attached to tranquility and coolness than to rapidity of fire," is maintained in all its force, being, in fact, interpolated after the new instructions on the use of the magazine, and so acting as a counterpoise to the new tendencies.

Fresh instructions for the training of the battalion in Germany codify all that can be said in favor of the repeater. "The magazine arm," say these instructors, "gives the soldier a continual reserve of ammunition, and, thanks to this, he can be always ready to deliver his fire. This reserve can be always assured, provided that a discreet and judicious use be made of it, and that all occasions for renewing it are profited by. The firer must never forget that the new arm increases the need for the most absolute fire discipline, and that it is destined to produce, not a superficially accelerated but a more efficacious fire. Officers and non-commissioned officers will, therefore, be careful that the magazine store is carefully husbanded, and only emptied at the decisive moment. At long and medium ranges fire round by round is enough. As a general principle the repeating action will only be employed at the very shortest distances. It is only in exceptional cases that it can be useful between 300 and 800 yards,

to profit by the momentary apparition of good marks, which for tactical reasons it may be desired to cover with a violent fire."

DRAGOMIROV'S MANUALS.

It is not practicable to give in full the instructions and suggestions contained in these manuals, but their spirit can be comprehended by reading a certain number of extracts from those paragraphs which appear to disclose most clearly the system pursued and the means recommended for insuring success.

EDUCATION.

The company chief is responsible that a good direction be given to the education of the men and all the cadres of his company. He has the duty of making sure that each man knows his work, and of taking measures to make good any deficiencies he may discover.

When it is a question of the private soldier, we must remember before all else that, during the fight, it is not by virtue of the training we give him that his legs carry him on with more or less intrepidity, and that his arms work in a more or less sensible manner. Here everything depends, in the first instance, upon the way the heart beats and the head reasons. It is, therefore, head and heart we must bear in mind before all else when we think of making soldiers. The time, when it is imagined that by addressing ourselves to legs and arms one also addressed head and heart, is past, never to return. No doubt many people do not think so, but this is inevitable when old customs are dethroned by new ideas. But even these people become apostates little by little.

Willingly or unwillingly, rifled arms compel them day by day and by slow degrees to accept many ideas which appear to them revolting heresies before.

It is incontestable that through legs and arms one can manage to drive a little something into the head, but to begin with, this something is not enough for a man who is called on to give his life for his country, and in the second place, very often we achieve the most unexpected results, directly opposed to those we have in view. It is, therefore, a great mistake in a company chief to imagine that by teaching his men bayonet work, musketry, evolutions and use of ground, that he has done all that is necessary, and that the rest will come in the ordinary course. One may be ever so competent at bayonet practice and musketry without having any ideas of military duty.

Seek, then, before all else, to engraft in the soldier's heart the sense of military duty; develop in his head ideas of honor and honesty; strengthen and elevate his heart, and it is the rest that will come naturally.

"Prefer ocular demonstration to verbal explanation in all cases where it is possible. It is better to show once than explain twenty times."

"Never forget that you address common soldiers, and that it is necessary never to give them more than one or two ideas at a time, and to require that they repeat at once what is told them; no discussions with soldiers; avoid words only employed in books; teach only what is indispensable

ble; seize every occasion for ocular demonstration, and use as few words as possible."

INSTRUCTION OF THE COMPANY.

The well-reasoned preparation of the company forms the base of all the military education of the infantry. If the companies are good, the battalion will be good too. The programme of instruction of the company is determined by the division of the fight into two periods: that of fire or preparation, and that of the bayonet or decision; the latter shows which of the two adversaries is worthy of victory. Company instruction thus falls into three branches:

(1.) Application of marches and formations in all kinds of ground without firing.

(2.) The same with ball cartridges.

(3.) Preparation of the company for the bayonet attack.

"All these exercises must be conducted in a manner to impress upon the soldier and the chief the knowledge of what each will have to do in battle, and at the same time to increase the self-confidence of all, so that none of the vicissitudes of the fight may surprise either soldier or chief, or take them at a disadvantage." Quoting Souvorov's example, General Dragomirov advises officers to have frequent conversations with their men on subjects connected with their profession. "Gentlemen," he says, "do not refuse to enter into explanations with your men about your common duties in battle. Great actions and the art of getting out of most difficult situations are only possible for him who knows the soldier, and whom, on his side, the soldier knows and understands." General Dragomirov next shows at length how to apply the regulations for company drill. In this he takes for his argument Napoleon's advice, that one should constantly think what one would do if the enemy were to appear suddenly in front, rear, or on the flanks, and with any arm of the Service. Taking a number of examples, the General then shows how to *apply the regulations*. These examples need not be discussed; they are intended to train officers and men to meet calmly the most critical dangers, and to overcome the most unexpected difficulties. Among various pieces of advice, it may be mentioned, that against cavalry the General recommends formations which bring as many rifles as possible to bear, while only exposing immediately to the hostile blow the smallest possible number of men. Cavalry will always, he believes, pass through the intervals, if intervals are left for them. He remarks upon the great importance of reducing to a minimum the time of all formations against cavalry, and of getting men in hand, perfectly calm and steady before the blow falls, *even at the sacrifice of the volley*.

"What the bullet cannot do," he says, "under 'tactical exercises,' the bayonet will; and this is the reason why, when once an attack has been launched, it must be carried through to the end, that is to say, to blood. No enemy lives who can stand firm in front of soldiers with a taste for the bayonet, and able to use it. Only we must not hammer the enemy in a dis-

orderly and dispersed mob, but by masses; thrust with a will, and disengage comrades in danger. Short rushes of the company supports are condemned. In open ground it is recommended to get what cover is available, and then advance by 300 to 400 paces at a time." The General considers that the firing line has a light job to advance compared with the march of the closed bodies in rear.

One of the peculiarities of the training of Russian infantry and cavalry is what we may call their traversing attacks, a system of field exercise only partially applied to the German and Austrian cavalry, but unknown elsewhere. The principle is that all troops attacking should be made to come to close quarters, whether infantry against infantry, cavalry against cavalry, or infantry against cavalry, and by passing through each other's ranks, become accustomed to throw themselves vigorously upon a hostile body of troops. In this action the pace has to be rapid when the movement for closing arrives; as a rule, when this is practised in the company, half waits the attack, the other half rapidly advances to the attack up to within 250 or 300 paces; here a halt is made to fire volleys, and the advance is continued; at about 100 paces the drums begin to beat the charge, at 50 the assailants charge bayonets, and at 20 or 30 raise a shout, and throw themselves through the intervals of their opponent's ranks; at the moment of contact arms are sloped.

The defenders are advised to send a few volleys when the enemy is 300 paces off, and then to await the moment when he is 50 paces off, "so that all may pass with calm." Order has to be immediately re-established. When cavalry attacks infantry, and *vice versa*, it is believed that good is done by accustoming men to the impression produced by a line of horsemen, while it teaches the horses to affront infantry fire without fear.

General Dragomirov forsakes the beaten paths of German military pedantry, and takes mainly into account the first instrument of battle, man. He studies human nature, the motives that sway men's minds, the weak and strong points of the Russian character, and, after strengthening the moral fibre of the individual soldier, attempts to establish, on a sure foundation, a truly national school of tactics. Nor does Dragomirov, or the school he so worthily represents, preach a blind obedience to cold steel, or antiquated methods of attack in heavy columns; on the other hand, they cling tenaciously to tactics of decision, and by idealizing the bayonet, by training men practically to wield it with vigor, and by impressing upon them the conviction that at close quarters nothing can stand before them, they go far to shorten and abridge the initial stages of an infantry attack, and hurry men forward to that crisis of the affair in which they have always been taught that they are invincible.

It must be repeated that to this school the bayonet is not a god, but an emblem, an outward and visible sign of that vigor and energy imparted to his troops by the impetuous Suvorov; that the lines of thought and action adopted do not necessarily impose heavy columns, and that the necessities imposed by modern infantry fire are fully understood."

J. C. B.

THE POSITION FINDER (WATKINS).

(Translated from *Revista di Artiglieria e Genio*, by 1st Lieut. Luigi Lomia, 5th Artillery).

Major Watkins' application of the position finder to the English sea-coast batteries, has produced an entire revolution in their Service. In future the presence of expert cannoneers in the various detachments will be superfluous. All that is requisite is to have men who are simply able to read the letters marked on a disc, can give the elevation accordingly and serve the piece. The pointing, an important element in the education of the soldier, will henceforth be obtained mechanically.

In order that we may be well understood, it will be necessary to explain briefly the working of the instrument, of which some dozens have already been put in operation in as many sea-coast batteries in the south of England.

The instrument is placed at some distance from the batteries for which it is destined, since the accuracy of the results depends upon the stability of its base, the latter being liable to injury, if placed in too close proximity to the pieces. The base is firmly imbedded in the ground and the sighting is through a loop-hole made in a plate.

The position of the instrument must be much higher than the sea level in order to obtain sensible angles of depression.

Several convenient positions have already been selected from which the fire from a group of batteries may be directed, each one of these, however, with its own appropriate apparatus.

Let us, now, consider one of these positions, and for greater simplicity let us suppose that it be in communication with a single cannon of the battery, though all the pieces of the battery are to be fired off in a volley. The operator looks through the telescope, placed upon the instrument and put in motion by means of electricity, the action of which is accelerated or retarded by means of a lever, which regulates its velocity, and which consequently allows of the easy following of the target by the operator; another lever serves to give a transversal movement, when the ship's course is from right to left.

The passage of the ship is indicated automatically upon a sheet of paper placed under the instrument. In this way, when the course of the ship has been followed up for a short and definite space of time, the place in which it will be found after a space of time equal to the preceding, can be foretold with great accuracy.

The course followed by the moving target is rapidly traced upon the paper, while the telescope revolves in the same angle. The exact position marked upon the paper is, consequently, known, and its actual distance is given by the telemeter, which constitutes part of the same instrument, as also the corresponding angle of elevation to be given to the piece.

The command "Point," is transmitted to the battery by means of a simple touch of a lever, and the same telemeter indicates automatically the angle on a disc placed in front of the pieces. The index of such a quadrant is continually in motion, while the instrument follows up the movement of the ship, but it stops suddenly at the command "Point," the index being made to correspond to the precise moment at which the instrument will

point on the ship after a previously determined space of time. The cannon has, meanwhile, been lowered, loaded by the detachment and once more raised to its proper place. The operator then looks through the telescope at the ship, and, if no accidents have happened, in a few seconds he will see the intersection of the cross hairs coincide with the moving object. Instantly he presses a button and communicates, electrically, fire to the pieces. It has been found in practice, that it is more convenient to fire all the pieces of a battery at once, and this can be done as easily as in the case of a single gun.

The following of the movement of a hostile ship with a telescope, and automatically seeing its course traced upon paper, produces a strange sensation, and the idea that an infernal operator seated in his cosy and safe hiding place is there calmly awaiting the opportune moment to throw destruction into the enemy's fleet, perhaps six or seven miles distant, represents something new in the annals of War. The management of the instrument is very simple, and by its means the most perfect courses may be traced by the indicator after a very short practice.

This brief sketch of an instrument so important, and which was furnished us by the Army and Navy Gazette, does not allow us to comment upon it as we should, and it is only through information received from private sources, that we are enabled to add that the indicator gave splendid results. At trials of recent date, in a practice of 25 shots at 3000 yds. every shot struck the target, the dimensions of which were 25 metres square.

Such satisfactory results may also explain the liberal compensation given to the inventor, £10,000 upon the delivery of the instrument, and in addition £1000 per annum for a space of ten years, which is equivalent to a total of a half million of our money (Italian liras).

REMARKS BY MAJOR WATKINS, R. A.*

The latest pattern is a great improvement on the *old position-finder*; we no longer use squares, and signal to the guns slightly in advance, but have resorted to what has been termed *predicted firing*. We found that with recruits and men not expert with the training and elevating gear, it was hopeless to follow a ship going at any speed, and that they required from half a minute to a minute to simply train and elevate. So now the Position-finder traces the course of the ship, and when the guns are ready to lay, predicts the position the ship will occupy half a minute or more in advance. The dials on the gun floor automatically indicate the range and training to hit that predicted position. When the guns are laid an electric tube is inserted, and a signal goes up to the observing station that all is ready for firing. The officer in charge of the Position-finder, which is, of course, laid on the predicted position, looks through the sights and watches for the appearance of the ship in the field of view, and when she arrives at the cross-wire, presses a button, and the guns are fired. Thus, if we have a small body of men well acquainted with the peculiarities of a fort and the working of the Position-finder, the rest of the work could be

* Remarks by Major Watkins during a discussion at the Royal Artillery Institution, Woolwich, October, 1886. (J. C. B.)

efficiently done by the Militia or Volunteers. At recent practice at a moving target towed in a zigzag course across the water, we succeeded in hitting the target five times out of ten rounds, the range varying from 2000 to 4000 yards, the gun being entirely laid by the predicted firing method.

One great advantage of position-finding is that the fort can really be commanded and fought by one officer. Take, for instance, Borisand, one of the outer defences of Plymouth Harbor; there we shall have six position-finders, separated from one another, but connected by a covered way. The commanding officer has simply to go from one instrument to another and point out the ship he requires the guns worked by those instruments to fire at. Each group is bound to follow and be truly laid for the particular ship the sights of the position-finder is aimed at. I may mention, incidentally, one great improvement that I trust ere long will be carried out, *that is, the graduating of the index plate with ranges instead of degrees.*

It is obvious that for a gun mounted at any given height above the sea, each degree of *quadrant elevation* shown on the index plate represents a certain range. Why, then, not at once have a *scale of ranges*, and not bother the men with degrees, which, without a table (and I venture to say not one of our forts have one), is absolutely useless.

I may, perhaps, be allowed to mention what has actually been done in the way of laying guns at night. An experiment was tried a short time ago by the Royal Engineers with the Position-finder for submarine mining at Plymouth, and it was found that with a very ordinary electric light we could follow a gun-boat with ease up to 2000 yards.

Now, it is just as easy to train a gun to a given number of degrees on the arc by night as by day, and, therefore, with the aid of the Position-finder there would be no difficulty in laying guns at night. You do not actually lay the sight of the gun on the ship illuminated by the electric light, but the cross-wires of the Position-finder being laid on the ship, the range and training are sent automatically to the guns. * * *

The groups are so arranged, now, that instead of there being a whole battery to one Position-finder, there is one Position-finder to one gun, as at Breakwater, or to two or three or four guns, according to the arrangement of the fort. All the guns of the group fire on parallel lines, but the groups are so arranged that few of the guns are wide apart.

ON COAST DEFENCE BY MEANS OF CURVED FIRE.

Major J. C. Dalton, R.A., D.A.A. G., reviews in the January number, 1889, Proceedings of the Royal Artillery Institution, the latest work of Major Ordoñez, Commandante de Artilleria, Spain, "On Coast Defence by Means of Curved Fire."

Major Ordoñez, the author states, is so well-known as a successful inventor of powerful guns, and as an accomplished scientific and practical artillerist, that any views of his on so important subject as the one he treats of, cannot fail to be valuable and instructive. The work is written specially to suit the requirements of Spain, taking into consideration her financial position, as well as natural conformation.

It is impossible, states Major Ordoñez, to protect sea coast batteries, except in a few special cases, with armor plates similar to those of ships, and, therefore, some means must be discovered which will more than re-establish the equilibrium between ships and coast batteries, and give the latter a superiority. This Major Ordoñez proposes to do by means of batteries of howitzers and rifled mortars in elevated positions, which, at short ranges, will be protected by their height from the accurate fire of ships, and which will be sufficiently powerful and accurate to strike and penetrate the most vulnerable part of an iron-clad, viz: the deck, at ordinary fighting ranges. He maintains that, now, after a brief period, during which guns were thought to be all-important, howitzers and mortars are again coming to the front, and have a great future before them. Taking into account both the service and experimental ordnance (in Spain) for garrison and coast defence, they may be divided into two groups:

(1). Steel guns, viz: Those of 9.8, 10.2, 10.6, 11.8 inches, which must be reserved for points of supreme importance on account of their great expense.

(2). Cast-iron guns: These form the general ground-work of the defence of the country. A considerable number must be employed on account of the extensive length of coast to be defended, and they can be manufactured at home with rapidity and economy. They comprise those of 5.9, 8.2, 9.4, and 12 inches, forming a harmonious and complete system of guns and howitzers, firing the same projectile. Hence the present study: (12 in.) howitzer.

In order to determine the ballistic conditions necessary for a howitzer, which shall be capable of competing with the most powerful war ships, Major Ordoñez quotes the armament and thickness of armor plating of the most formidable modern iron-clads of the English, French and Italian Navies, and, thence, arrives at the conclusion that his howitzer should be, at least, 12-in. calibre. This calibre is sufficient to penetrate the thickest armor, which could be opposed to it at all ordinary fighting ranges up to 8.746 yards; and the projectile must possess the necessary amount of energy, at least 849.5 foot tons, at any range when the angle of descent is 45 degrees, and be capable of velocities and elevation which shall produce long ranges.

The weight of the projectile fired from the 12-in. gun is 837.5 lbs., with a velocity of 52.5 turns per second; but, as the proposed howitzer cannot give a greater velocity than 984 f. s. owing to its short length, the above-named projectile, even if it could be fired from the piece, would not be the best adapted to it.

Taking into account the velocity of rotation requisite, the length of the projectile should be 2.8 calibres, and its weight should not exceed 595.09 pounds, including a bursting charge of 30.9 lbs. Similar reasons have induced the Italians to give their 11-in. howitzer a projectile of 476.06 lbs.; the French to give their 9.4 in. experimental mortar a shell of 264.5 lbs., and Krupp to his 11-in. mortar a shell of 473.8 lbs.

He selects, provisionally, the projectile of 606.1 lbs., and maintains that, with different charges, the 12-in. howitzer will give initial velocities of from

328 to 1,016.8 f.s. at high angles of elevation, and will penetrate the armored decks of the most powerful iron-clads at any practicable range.

	W. of Projectile.	Angle of Projection.	Initial Velocity.	Remaining Velocity.	Range.
			F.S.	F.S.	YDS.
Hooped cast-iron....	606.1 lbs.	45	984	741.2	8,048
Howitzer 12-in. calibre	837.5 lbs.	45	836.4	711.7	6,784

As 2,187 yards, with an angle of descent of $61^{\circ}13'$, the normal component of the velocity of impact will be 393.6 f.s., which will penetrate 3 to $3\frac{1}{2}$ inches of iron, this being the maximum thickness of the decks of iron-clads.

As to the accuracy which he expects from this piece, he deduces it from the known results with similar weapons [Krupp's 11 in. and Italian 11-in. howitzers]. Major Ordoñez calculates the probability of hitting at 4,921 yds. a horizontal target of 328 ft. x 59 ft., when the length of the vessel is normal to the plane of fire, at 24 per cent., which shows the terrible nature of curved fire against iron-clads, costing some 5,000,000 dollars, which may be destroyed by one projectile; and having accepted the necessity for imparting to a projectile of 606.1 lbs., an initial velocity of 984 f.s. at high angles of elevation, he proceeds to discuss the necessary conditions of the piece as to the most suitable metal and system of manufacture. *Steel* should be employed when guns of extraordinary power and great mobility are required.

It is not at all necessary that steel should be the only metal for guns, when it is a question of supplying the armament to a country like Spain, which possesses so extensive a coast-line; he considers that the bulk of the ordnance should be of cast-metal, steel being reserved when the maximum penetrating power is required. It is only necessary to compare the estimates for the production of two guns of equal ballistic power, one of steel and the other of cast-iron, to know that the cost of the latter will be one-third that of the former. It will, certainly, be heavier if it possess similar qualities to the former, but this matters little for pieces which do not require to be moved from the battery.

Length of Bore.—Taking 984 f. s. for the necessary velocity, and 0.86 as the highest co-efficient of utility of the powder, on account of the low pressures which will be set up in the piece, Major Ordoñez arrives at the following dimensions for the bore, viz.:

Length..... 10 calibres
 Work obtained per kilogramme of charge..... 169.89 foot-tons

Rifling.—Theory points to the increasing twist, but experiments in Italy, with new hoopled cast-iron 11-in. howitzer, has proved the superiority of the uniform twist. The author, therefore, proposes that the *inclination of the groove* should be helicoidal—one turn in twenty-five calibres.

From the work developed by powder in its expansion, the author de-

duces an initial velocity of 984 f. s. for the 606.1 lbs. of projectile, admitting a pressure of 9.5 to 10 tons per square inch, and then, in order to arrive at the class of powder which would give these results, he employs Sarau's formulæ, as applied by Lieut. Medcalfe, of the U. S. Artillery (Ordnance), and concludes that a powder (though of prismatic form) similar in rapidity to the American hexagonal powder, mark O. B., would fulfil the conditions required.

The following are given as essential conditions ;

- (1.) The mounting, etc., should allow of an elevation of 65 degs., and a depression of 6 degs.
- (2.) The axis of the trunnions should be at a height of 6.8 ft. to give cover to the detachment.
- (3.) The platform should have a slope to the front of 3 degs. only.
- (4.) The elevating, traversing and running gear to be the same as for other heavy guns.
- (5.) There must be two hydraulic compressors to withstand a pressure of 200 atmospheres.
- (6.) The pivot to be in the front part of the platform, which is supported on 8 cast-iron trucks, the base resting on wood (the elasticity of which will absorb some of the force), and fixed by strong bolts to a block of hydraulic cement. The whole surrounded by a mass of clay, will constitute a foundation with the requisite solidity.

OTHER DATA.

No. of grooves, 60.
 Total weight of piece, 13 tons 12 cwt. 2 qrs. 1 lb.
 Weight of projectile, 606.1 lbs.
 Initial velocity, 984 f. s.
 Length of projectile, 2.9 calibres.
 Weight of charge, 52.9 lbs.
 Class of powder, prism., 1 perforation.
 Density of charge, 0.726.
 Normal pressure, 10 tons per sq. in.
 Range with 45 degs., el. and full charge, 8,746 yds.
 Energy of movement, 4.074.3 ft. tons.
 Pen. into iron at 2,182 yds. at an angle of descent of 45 degs., 4 inches.
 Probable prices : gun, £960 ; mounting, etc., and foundation, £800.

France, notwithstanding her great steel-works, is making mortars of 11-8-in. and 9-4-in. of hooped cast-iron for coast-defence.

Italy, with the exception of four Krupp guns of 120 tons recently mounted to defend the Gulf of Spezzia, and a few steel 11-in. guns, has not only armed her coasts with hooped cast-iron guns, but is making fresh experiments with cheap cast-iron 4.7 and 5.9-in. guns for forts in view of the large number required.

Austria wishes to replace her fortress guns of the 1861 pattern with modern 4.7 and 5.9-in. cast-iron guns, with which she is experimenting.

England is not adopting the same line of action, but her coasts are not defended ; because, considering the extensive nature of them, the four 100-ton guns in the Mediterranean and a few 9, 10 and 12-in. guns at Ports-

mouth, Plymouth and Dover, are only exceptions; as she relies for her defence on her powerful fleet.

In this country, U. S., the general defence scheme is based on steel B. L. rifles of 8, 10, 12 and 16-in.; quick-firing guns yet to be determined; and hooped cast-iron B. L. rifled howitzers of 12-in. This last differs somewhat from that proposed by Major Ordofiez, and is a more powerful weapon. This piece is composed of a cast-iron body, two rows of steel hoops and a breech ferreture upon the interrupted screw system. The hooped portion is cylindrical and extends from the breech to a short distance in front of the trunnions. A cylindrical shoulder is formed in front of the hoops from which the chase tapers conically towards the muzzle. The interior consists of the rifled portion of the bore, the chamber and screw-box. The chamber is formed of three slopes or conical surfaces and two cylindrical. The first and second slopes, with the intermediate (or first) cylinder, estimated from the front, form the shot-chamber. The third or rear slope forms the seat for the mushroom head of the De Bange gas-check. The screw-box consists of three parts, the forward or curved surface, which connects the chamber with the cylindrical surface forming the base of the screw-threads, the interrupted screw-thread, and the short recess in rear. The screw surface is divided into six sectors, three being blanks, alternating with the three threaded screws. The hoops are of Midvale steel. The inner row consists of seven hoops, the outer of six hoops including that of the trunnion. They are so arranged as to break joints.

The following are the principal dimensions.*

- Calibre, 12 inches.
- Length of bore, 107.62 inches.
- No. of grooves, 68.
- Width of grooves, 0.379.
- Depth of grooves, 0.07.
- Twist uniform, one turn in 35 calibres.
- Weight of projectile, 627 lbs.
- Initial velocity (by direct measurement), 1,150.3 f. s.
- Remaining velocity, 2,000 yds. direct fire, 1,003.2 f. s.
- Remaining velocity, 10,480 yds., 854.9 f. s.
- Energy at 2,000 yds., 4,379.74 ft. tons.
- Energy at 10,480 yds., 3,330.4 ft. tons.
- Angle of descent, 10,480 yds., $53^{\circ} 51'$.
- Length of projectile, 34 inches.
- Weight of charge, 80 lbs.
- Density of charge, 1.113.
- Class of powder, Brown pris., one perforation.
- Normal pressure, 27,112 lbs. per sq. in.
- Energy of movement, 5,758.3 ft. tons.
- Range with 45 degrees elevation and full charge (measurement), 10,480 yds.
- Weight of gun, $14\frac{1}{4}$ tons.
- Energy per inch of shot circumference, at 5-mile range, 48.6 ft. tons.
- Mean error in Range, 10,480 yds., 62.5 yds.
- " Deflection, 10,480 yds., 41.9 yds.

* Records and calculations of velocities, etc., kindly furnished by Capt. Greer, Ord. Dept.; 12.5 to 14.5 ft. tons is sufficient to penetrate 3 inches of deck iron.

Regarding the value of the guns, we might add a remark made by Major N. Walford, Royal Artillery, in 1886. "It is implied that the principal damage to the ships, during the bombardment at Alexandria, was done at the time they were anchored. The ships were at first formed in line ahead, and passed the forts in that formation at a distance of about 1500 yards. As a matter of fact, it was during that time (two hours) that nearly the whole of the injuries to the ships were inflicted. They then withdrew out of action to a distance of about 2500 yards, and there anchored and bombarded the forts; and I was told by a newspaper correspondent, who was present on the occasion, that the moment the ships anchored and commenced their fire, the fire of the forts slackened. That, I think, is proof positive, if any proof can be positive, that in the future naval action against forts, ships are very little to be feared, so long as they are on the move; and they will be best kept on the move, I think, by the use of howitzer batteries in position in-shore, out of sight of the ships. The moment a ship anchors, and its range is discovered by the Position-finder, a salvo should be fired at her from a howitzer battery, so as to compel the ship to shift her position; and while she is shifting her position her fire will be of very little value.

J. C. B.

THE DEFENCES OF NEW YORK IN 1812.

An interesting paper on the fortifications of New York city and harbor in the War of 1812, was read, recently, by Mr. R. S. Guernsey before the Military Service Institution at Governor's Island.

Mr. Guernsey has been engaged, for years, in hunting up old manuscripts, maps and records relating to the early history of the country, for a book which he intends to publish. He showed himself thoroughly familiar with the subject, and described in detail many fortifications which are not mentioned at all, or are but vaguely referred to by the best historians. His data he gathered from the records in the War Department, documents and books in the libraries, and files of papers published at the time. He also consulted English accounts of the War.

In opening, Mr. Guernsey said that the importance of constructing proper defences for New York was realized by the nation as soon as it achieved independence. The ease with which the British took the town early in the Revolution, and the difficulty in getting them out of it, had taught the proper lesson. In 1794, surveys of the approaches to the city were authorized, and were conducted by George Vincent, a French Engineer, acting under the direction of Gen. Knox. Those on Staten Island were erected and equipped by the State of New York, and not by the general Government. These were Fort Tompkins, Fort Richmond—now called Fort Wadsworth—Battery Morton and Battery Hudson. All the States after the War were in debt to the General Government for a portion of the Revolutionary expenses, which they had not paid. In 1799 a general law was passed requiring all the States to pay the amounts due in the following year, or to expend the amount of their indebtedness in erecting fortifications on their own territory within five years.

FORTIFICATIONS FOR DEBT.

The indebtedness of the State amounted to about \$2,000,000. New York State decided in March, 1800, to pay its debt by erecting fortifications. Commissioners were appointed and work begun. A total of \$891,129.31 was expended, and the State was released from its indebtedness. Not another State paid its indebtedness or erected fortifications. In addition to the Staten Island defences, erected by the State, the General Government built works on Governor's, Bedloe's, and Ellis Islands, at Battery Parade—now Castle Garden—and two magazines in the city. One of these magazines was located at Bridge Street, and the other in Madison Square, opposite where the Fifth Avenue Hotel now stands. The total amount expended by the Government was about nine hundred thousand dollars.

Previous to 1807, there were no fortifications of any kind on Staten Island. In 1808, Col. Jonathan Williams, of the United States Corps of Engineers, and after whom Williamsburg was named, prepared an extensive plan for the fortification of New York harbor. Under his direction the fortifications on Staten Island, the State Arsenal, on Elm Street, in the city, and Castle Williams, on Governor's Island, were constructed, and old Fort Jay, in the centre of Governor's Island, was rebuilt and named Fort Columbus. All this work was done at the expense of the State, and between the years 1807 and 1812. At the breaking out of the War, in June, 1812, the following was the full complement of men required to man the forts that protected the City of New York :

Fort Columbus.....	780
Castle Williams.....	1,014
Bedloe's Island.....	312
Ellis Island.....	182
S. W. Battery (Castle Garden).....	364
North Battery (Hubert Street).....	208
Field pieces at arsenals.....	442
Total.....	3,302

The total number of guns and mortars in these works was 258. This did not include the fortifications on each side of the Narrows. On the Staten Island side, at Signal Hill, Forts Richmond and Tompkins and Batteries Morton and Hudson were erected ready for occupancy. Battery Hudson mounted 35 cannon, Battery Morton 12 cannon, Fort Tompkins, 20 guns. The Marine Battery, on the Staten Island side of the Narrows, was 430 feet in length and one foot above the level of the Sound. It would mount 25 heavy cannon. The 32-pounders were called heavy cannon in those days. They were made of coarse iron, were very rough, and weighed a ton and a half each. The heaviest pieces were the Columbiads at Castle Williams, and they were only 50-pounders.

SIGNALS FROM SANDY HOOK.

A line of telegraph signals was constructed from the Highlands, back of Sandy Hook, to the Navy Yard in Brooklyn and this city about June, 1812. The signals were a number of black and white balls, which were hoisted on

tall poles, so that intelligence of a limited nature could be transmitted. It was a great thing, at that time, to be able to signal the approach of the enemy, off Sandy Hook, to the city in fifteen minutes.

On the Long Island side of the Narrows there were no forts, but on the bluff near Bath, which was called Denyse's Heights during the Revolution, was an earthwork that would mount from twenty to thirty pieces of very effective artillery. It is now Fort Hamilton. There was no fort on Hendrix Reef, where Fort Lafayette now stands, although one had been recommended by the Secretary of War, in 1794. It was thought that Castle Williams and the batteries were sufficient for that time. When the means of navigating vessels, then, is considered, the fortifications were probably strong enough. The wind and tide must be favorable for an attempt to enter the harbor and run the gauntlet, subject to the cannonade by vessels and land batteries for many miles, and it might not be possible to return when desirable. The sandbars of the unfamiliar harbor were also against the enemy.

FORT GANSEVOORT.

In 1812 a new fort was built at the foot of Gansevoort street, where the new market now stands. It was named in honor of Gen. Peter Gansevoort, of Revolutionary fame, then just deceased. It was built of Newark red sandstone, but being whitewashed it was known as the "White Fort." It is a fact worth noting, that Castle Williams, Castle Garden, the fort off Hubert Street, Fort Lafayette, the back part of the City Hall and the "White Fort" were all built of Newark sandstone from the same quarry. Fort Gansevoort was built to mount nineteen guns, and had a magazine, an arsenal and extensive barracks. There is no record of its having been mounted with cannon. The south battery on Governor's Island had been erected since the declaration of war. It mounted fourteen guns *en barbette* and commanded Buttermilk Channel. On the eminence back of Jersey City—then a hamlet of a dozen houses called Paulus Hook—the Government erected an arsenal, magazine and laboratory for the manufacture of powder and other munitions of war. It was surrounded by a fortified camp, occupied by from 500 to 800 New Jersey State militia. When Gen. Ralph Izard took command of New York in 1813, he proposed that Battery Park should be fortified. As it belonged to the city, the Common Council granted permission to erect breastworks there. This was done and a number of cannon mounted in April, 1813.

Sandy Hook, in 1812, was less extensive than it is now, and the lighthouse then used, and another since erected, both of which were on the northern extremity, are now so far inland as to be useless. There were three cannon at the lighthouse for the purpose of signaling the approach of the vessels of the enemy. On Telegraph Hill, now known as the Highlands, a good-sized fort was erected in 1813. The English were expected about July 1, 1814, and the people were fully aroused to the danger of an invasion. Additional fortifications were regarded as immediately desirable at the Narrows, and United States engineers reported that the erection of a fort on Hendrix Reef, 500 feet from the Long Island shore, would reduce the width of the Narrows to seven-eighths of a mile. Fort Diamond, now

Fort Lafayette, was, accordingly, begun and was completed in the fall of 1814. It mounted seventy-three guns in three tiers. Block houses and earthworks were also built where Fort Hamilton now stands, and named Fort Lewis. Lines of intrenchment were built, in Brooklyn, from Gowanus Creek to Wallabout Bay, and extended eastward as far as De Kalb avenue.

DEFENCES ON EVERY SIDE.

These were for defence against attack by land from the rear. On Brooklyn Heights strong redoubts, called Fort Smith and Fort Lawrence, were built. Fort Greene, mounting twenty-three heavy cannon, was erected in 1814 to cover the Navy Yard and Wallabout. The parapet of Fort Greene was more than half a mile in length. At Newtown Creek and the East River, a block house, mounting several large cannon was built. Hallet's Point had Fort Stevens with guns. On Lawrence Hill, to the southeast, stood Castle Bogardus with several guns. Extensive earthworks were built on Ward's Island. Mill Rock had a block house with heavy cannon. On the New York side, near Ninetieth street, was a redoubt commanding Hell Gate. These works were large enough to mount thirty heavy cannon, besides several mortars, so arranged that half of them could concentrate their fire on any one point in the river.

At Benson's Point, at the mouth of Harlem Creek, near 106th Street was a strong redoubt. A line of defence extended from this point entirely across the island from the East River to the Hudson. At the head of Harlem Creek began a parapet and ditch extending to Fort Clinton on the high rock between 106th and 107th streets, in Central Park, and 410 feet west of Fifth Avenue. Connecting with Fort Clinton and extending westward like a bridge over McGowan's pass was a block house called Nutter's Battery. It was located at 107th Street, 572 feet west of Fifth Avenue. These two forts were connected with Fort Fish, named after the father of Hamilton Fish, and located between 105th and 106th Streets, 300 feet west of Fifth Avenue. Fort Laight was located just north of 124th Street and east of Eleventh Avenue, and commanded Manhattanville and Harlem Plains. A line of intrenchments ran from Fort Laight across Riverside Park, near the present tomb of Gen. Grant, to the high, precipitous banks of the Hudson.

The land defences were aided by forty-two gunboats, war vessels, and the steam frigate which was launched in October, 1814, and by torpedoes stretched across the Narrows.

This was the condition of the defences of the city and harbor of New York in October, 1814: There were 570 field pieces mounted, cannon and mortars, aside from those of the gunboats and war vessels, which made over 900 in all. The defences were manned by 25,500 men, who could be concentrated at any given point in three hours. The enemy, undoubtedly, had knowledge of this fact, and the blow intended for New York city was struck at Baltimore and Washington,

J. C. B.

Comment and Criticism.

I.

"Giants in Spiked Helmets."

Bvt. Major-General S. Wylie Crawford, U. S. A. (Retired).

A LETTER just received from Gen. Crawford, who is at present in Germany, contains the following passage: "Looking out of my window this morning, as the snow is falling and folks are hurrying to and fro, and Hans and Gretchen are crowding around a great bronze fountain near by, I observe two giants in spiked helmets coming along; marvelously neat and soldierly, side-arms and helm, not loitering, but intent on business and with no word or look for Gretchen at all. They at once renewed a train of thought in which I had been lost, and the result I want to give to you. Nothing could be more in contrast than the military system, perfected and practised by these people, and that by ourselves—assuming that ours is a system at all. Beyond all others, this Nation seems to possess the force and vitality of man. The whole country is transformed into a nation where force is the only arbiter of human destiny, and *Right* is wholly subordinated, in policy and assertion, to *Might*. A country where ambition's highest ideal is to be a Prussian Guardsman, and yet a nation where the true principles of civil and political liberty are the ideal whose assertion is prevented, owing solely to its geographical position; just as our own, on the contrary, gives to us the right and the power to assert and maintain, as *republican* principles, what would be otherwise impossible.

In no other country in the world is there, or ever was there, such a supply of men of training, capacity and character for the conduct of armies. Every national enterprise neglected, every progressive movement systematically crushed for the sake of accumulating arms and soldiers. Every moral and physical force in the country, brought to bear upon the invention and maintenance of the means to destroy life in the shortest manner; involving a strain of expenditure so heavy and continued as to exhaust and impoverish the country before the hour of danger comes. After all, it is but an experiment of twenty years as yet, and it is too soon to assert what its effect is to be on European society and politics.

There is a *caserne* here, a beautiful barrack of brick, and there, and in the vicinity is quartered the 5th Westphalian Infantry. I am going out to see them and to go over the place and watch the command for a day. I am to see their new magazine gun." * * *

II.

"Revision of the Tactical Gaits Prescribed for our Cavalry."

Bvt. Major-Gen. P. St. George Cooke, U.S.A. (Retired).

YOU, officially, invite my "comments on any or all of the points contained in the paper by Colonel Hughes, Inspector-General, 'Revision of the Tactical Gaits Prescribed for our Cavalry' published in the March number of the JOURNAL."

That article contains more important matter than the subject of cavalry gaits; and proposes a series of paragraphs as amendatory of a work, which stands for "cavalry tactics." Colonel Hughes—so commendable for his interest and zeal for its amendment, seems to have met with some exceptional experience in his inspections of cavalry—and, presumably, in garrisons with well fed horses. "The movements were listless and dragged badly. There was a total absence of that spirited movement and evident resolution of purpose which were so distinguishing a feature in our cavalry during the latter part of the Rebellion;" and he became convinced, by experiments, that these, and other great faults in the gaits, were chiefly the results of the "erroneous rates of speed given to the various gaits in our tactics," which he considers much too slow. But our "tactics," does not fix a rate of speed—for the gallop or trot, and variations of the guides in his experiments, seem authorized by the variations allowed in the "tactics."

Doubtless, there was more of "purpose," in the riders during the War; but the horses were very frequently over-worked and underfed, and their "spirited movements" should have been reserved for the very numerous battles of combat; in which, in general, he thinks "not a second of time should be lost through slowness of movement," under fire. He recommends that the gallop rate be increased to a mile in five minutes; and that a "double gallop" be added, at a speed of a mile in four minutes.

Col. Hughes, seems a little peculiar in that he proposes these higher rates of speed, as conducive to greater cohesion as remedial to the disorders he has observed. But it is a very old, and still existing cavalry creed, that unity of action in gallops and charges, can only be accomplished by moderate and restrained gaits; at a gallop faster than ten miles an hour, it becomes very difficult to keep excitable horses in hand; beyond that speed their increased momentum and excitement leads to *running off*.

I am convinced that even his slowest gallop rate, for even small distances—a fourth, or a half of a mile—attempted on the broken and obstructed ground of an average American battle-field, would result in dangerous disorders.

Col. Hughes proposes the walk should be fixed at four miles an hour. This is the gait chiefly for marches; most horses *can* walk that fast, but I think that three and three-fourths miles an hour is about the average gait of well worked horses; to push them at this, as at any other pace, adds much to their fatigue—out of proportion to any gain.

I will confess that I have attached less importance to this matter in our old times; with much divided regiments, the changing and building of cantonments—there was little opportunity, or encouragement to it. And I am pretty sure there was no training to gaits during the War; and have we heard or read of any complaints or excuses for any cavalry short-comings as arising from that deficiency? And pushed day and night—in combats almost daily—more than once successfully attacking intrenched infantry—how spirited and successful they were! until, at the crowning scene of the great tragedy, in Virginia, they seemed to become the masters of the situation—that the part of stage managers had naturally fallen to their lot!

For the charge, Col. Hughes proposes "full speed." I confess I have done the same—but with restriction of the command being given within twenty to sixty paces of the enemy; if it be faulty, it is a choice of faults. I agree with Col. Hughes that rates of speed for each gait should be prescribed. Also to his "No. 3," if, indeed, its matter should not be left to commanders. Much may be expected from the opening opportunities of the great numerical increase of our cavalry and from concentrations, in even greater proportion; a spirit of reform and improvement has been stirred up under happy auspices at Fort Leavenworth.

I agree, also, with Col. Hughes as to the importance of the change to officer guides, always at centres of lines, and to his suggested increased intervals between mounted troopers.

But this "tactics" is not worth minding! patching it would only prove "premeditated poverty." It was the abortive offspring of assimilation and * * * a copyright.*

It seems that I agree substantially with Col. Hughes in all his points save, in part, the matter of the speed of gaits. But, *mutatis mutandis*, might it not be written, he substantially agrees with me? for they can all be found consistently elaborated in my work, which has been on sale at Van Nostrand's since 1883.

I should, probably, never again have been heard from on this subject, but for the invitation, and my duty as a member of the Institution; but it has been opened by others, and I feel that I have a little more to add: [some of which may be new!]

My new work, printed and published by Van Nostrand at my expense, is a revision of a MS. which General Schofield's Board, at his Headquarters in St. Louis, substantially—in very great part literally—adopted and reported, with systems for the other Arms; they were "approved," but made utterly futile by a juggle of the then Secretary of War, in favor of an old copyright. I did not much expect that officers would purchase and read it, although above thirty presentation copies were sent to cavalry and some general staff officers; but I had hopes that the War Department, always so unfortunate with tactics composed by Boards, would adopt it on trial and *general* approval by cavalry commanders; for a friend wrote a circular to regimental commanders, suggesting applications to the War Department to send copies to be put in the hands of their officers; [*two* handsomely anticipated the circular—to which I think there was, otherwise, no response.]

I counted on another accidental advantage: a colonel of cavalry having been a member of the Schofield Board, and being, of course, very familiar with the MS.—which they substantially approved—was interested, and kind enough to read over, much of it with me, my revision of it; [and made some valuable suggestions, founded upon his unequalled experience in the War, in every grade, from lieutenant to major-general, inclusive.] He then "heartily commended it for use in the Army," for 'valuable changes in the interests of rapidity of manœuvre and celerity of formation. . . . So important for the effective action of cavalry under the changed conditions for its uses in modern warfare.' " This is printed in an introduction.

I, afterward, had an interview with the Secretary of War, and sent him, at his request, in writing, the substance of the grounds of my application, viz: That, as a change had been resolved, the prestige given to my work should induce him to avail himself of a method to thoroughly test its value, which was only made practicable by my having put it in print; which was to put it in the hands of all the cavalry officers,

* Gen. Sherman, alluding to the Tactics Board at West Point, wrote, in March, '76: "The War Dept. had informed me that any change must not touch the infantry tactics, for they belonged to Upton. Therefore, the only change practicable was to make the others conform to it * * * he had a monied interest at stake in case of any changes."

with instructions to commanders to give it more or less thorough trial, and to make reports; not of individual criticisms of details [for *all* such agreements must be compromises,] but for or against. Indeed, there was choice, to constitute all the cavalry officers a quasi Board, and have their votes reported—in numbers.

Even if the book failed to pass the ordeal, there must result improvement to young officers, by the excitement of an intelligent professional interest; by some, relief of the mental stagnation, which *used* to be—at least—common and detrimental at outposts.

The Secretary made no answer; he went home; I think he never saw it; for, in fact, by a *very* extraordinary strategic manœuvre it got to the Adjutant-General's office, there to repose with the applications of the two colonels for copies. And that's "how not to do it!"

Lieut.-Col. A. K. Arnold, 1st Cavalry.

I have read, with great interest, the article by Col. Hughes on the "Revision of the Gaits of Cavalry Horses" in the last JOURNAL, and I believe that it suggests a step in the right direction for making our cavalry more effective.

I am in accord with him in his recommendation in respect to the tactical rates of speed at a trot and gallop. I believe his proposed General Order would work beneficially, if adopted, in our drill regulations. In his discussion I do not think he gets at the root of the evil complained of, consequently he does not give the true reasons for the "jiggle" or the "high-jumping" motion which he observed in horses while witnessing the drill manœuvres of cavalry during his inspecting tours at posts.

Leaving out of consideration the question of speed at the walk, trot and gallop of the different chevaline families which compose some "Troops," I think the want of regularity in the cavalry movements at drill, and the variableness of gaits, when all horses should be at the same, arises more from a lack of proper and frequent handling of the horses, and a lack of mounted drill. The men, as a rule, are only thrown with their horses at stable hours, and at such times as the post commander decides upon for mounted drills. These drills are, generally, of an hour's duration per day, Saturdays and Sundays excepted, and then only during fair weather, as we have no covered riding halls to take advantage of during inclement weather. The number of days lost on this account and for other causes in the course of the year is about $\frac{2}{3}$ of the 365.

In addition to the foregoing, recruits joining regiments are placed in the "troops" for platoon and troop drill long before they are efficiently instructed in the school of the soldier mounted. They are not expert riders, nor can they manage their horses. New horses have seldom any training; they are never bitted properly, and are not often taught the gaits; consequently, under these circumstances, it takes very few such horses and riders to cause disorder and waverings in ranks, even at a walk. When the horses are the least crowded or squeezed, they will take the jiggle gait, or rush forward or fall back. There is no steadiness. The cohesion of the line is marred consequently on one flank or the other; there will be a jostling of horses and a wavering of the line, no matter how correct or steady the guide's horse may be marching. I have had some experience in these matters. During a short time, in 1885, I had command of a battalion of cavalry at Fort Bayard, N. M. At my first battalion drills I noticed the disorder and waverings in ranks in marching to the front. Upon inquiring, I found that I had a number of bronchos which had never been really broken, they being so vicious that hardly a man would have anything to do with them; besides, we had a batch of recruits who were not drilled to an extent fit to enter into the battalion, and most of them were more or less timid in handling their horses. I set about immediately to try and remedy this state of affairs. The Rarey method was commenced on the worst horses. The rawest recruits were instructed daily in the school of the trooper.

All men had free access to their horses at all times during the day, and were encouraged to be with them as much as possible, to ride them, to teach them to lie down, to accustom them to all kinds of noise, and to stand fire without flinching; in fact, to thoroughly break in their horses, so as to make them obedient, fearless and tractable. At the end of three months my drills of all kinds were most satisfactory. At the command trot or gallop it was seldom that a horse deviated from the gait indicated. The good effects thus produced were noticed by all the officers, and quite a number became enthusiastic over the methods employed.

Col. Hughes' remarks in regard to the difference of the movements of the cavalry in the late War and the movements of the same, now, I think can be readily explained. During the War we were constantly drilling, or if not drilling we were marching. The result was, our cavalry horses became regular and steady in their gaits. The men, by constant contact, became expert riders and had confidence in themselves. Their horses knew them and were ever ready to second their endeavors, no matter how difficult the trial imposed. To-day our horses are not worked enough to make them steady or obedient; they barely get enough exercise to keep them in a healthy condition. How often, in going the rounds of the stable, one finds horses with swollen legs or a case of founder, caused by over-feeding and insufficient exercise. Some troop commanders pride themselves in making a show of a body of sleek horses, rolling in fat, when an inspector visits their post. Standing at the picket line or in the stable—"eating their heads off," so to speak—they become unmanageable when on drill; or, when called upon for some duty which requires speed and endurance, they soon break down and become unserviceable.

There is another point to which I desire to call attention, although it does not bear directly on this subject, but, nevertheless, it has some influence: that is, the class or quality of horses furnished the cavalry regiments. On account of the small amount paid for horses, cavalry regiments do not get a good class. If they do happen to get a horse, which in outward looks seems suitable for the Service, he generally develops some mean trait, and, no doubt, had been sold because his owner could not do anything with him. To have good horses, more money, per horse, should be paid. It is the same with horses as commodities—the better the class of article the higher the rate to be paid.

Bvt.-Colonel Louis M. Carpenter, Major 5th Cavalry.

The paper of Colonel Hughes upon the tactical gaits of our cavalry is very timely and is of great interest and importance. I agree with him in his deductions and recommendations, based as they are upon careful consideration and reliable data. There has, unquestionably, been a great want of uniformity in the gaits as practised on the drill-grounds, which may be ascribed in some degree to the latitude given in the tactics, but a great deal more to a want of attention to the subject, and consequent inaccuracy on the part of drill-masters. The problem that now presents itself is, to train horses in cavalry to accomplish considerable distances at as rapid a gait as can be adopted without winding the animals, and, after traversing these distances, to be enabled to deliver the charge with effect. The trot at seven miles an hour would adhere to the present regulation, but it is, I think, an excellent gait for a long-continued effort, and for ordinary manoeuvres. The gallop at twelve miles an hour, as recommended by Colonel Hughes, is faster than the maximum rate in the present tactics, but at 350 yards per minute it would be behind all the requirements adopted in Europe, and as it will be necessary sometimes, under fire, to cover 1000 yards as quickly as possible, it cannot be considered too rapid. It certainly cannot be considered too rapid when we find that the German cavalry, at 437 yards per minute, are required, according to Von Schmidt, in his "Instructions for Cavalry," in ordinary peace ma-

nœuvres, to keep up the full gallop for from 600 to 800 yards, calmly and evenly, without rushing, and the horses in hand; the charge then to be commenced at from 120 to 150 yards from the supposed position of the enemy. "The attack can only reach perfection at its culminating point, the actual charge, when the squadron is able to maintain a long racing gallop, with order, calm and certainty, without rushing to the front, getting out of hand, or commencing the charge before the leader intends it, or before he has given the command for it. Efficiency of this kind can only be obtained by protracted gallops."

I think favorably of the proposition to increase the speed shortly before the charge is delivered, as would be accomplished in "the Double Gallop," but would like to see it practically demonstrated.

From my experience, the mile in fifteen minutes can be made at the walk after considerable training, where a whole troop is concerned, but it requires a good deal of education before it can be obtained from some horses, and in many cases animals will be found to break into a trot unless very much quieted and brought down to their work by long marches.

The gait should, I think, be fixed at something less, say 112 or 114 yards per minute, and Colonel Hughes seems to have arrived at the same conclusion. It seems impossible to attain a rate of 122 yards per minute at the walk, as is adopted in the Austrian drill regulations.

The steadiness of horses in our Service, at the fast gaits, is affected very much, in my opinion, by the fact that they are not bitted properly, and they never can be with the bit now issued to the cavalry. The animals are restive because they are in discomfort and often in pain, and until this difficulty is properly provided for, it is useless to expect docility, satisfactory conduct in ranks or gratifying results. The more the horse is checked up or restrained by his rider, the worse the trouble becomes, and in many cases it causes bolting and plunging to escape the torture. With the present bit, the mouth-piece is often not of the proper dimension. The "port" rarely suits the tongue, and the lower "cheeks" are too long and give too much leverage. The bit is heavier than necessary, and should be replaced by one similar to that recommended by Major Dwyer, of the Austrian Service, in his excellent book on "Seats and Saddles, Bits and Biting." If this matter was rectified, I feel assured that it would go a long way in improving the steadiness of our cavalry when trotting or galloping, if the necessary preliminary instruction in equitation and horsemanship has been carefully attended to.

When men go on mounted pass, or get control of their horses away from the observation of their officers, they are very much given to taking "the lope" on such occasions, and it requires close attention and strict discipline to prevent this. The reason is that this "bastard" gait, from a cavalry standpoint, is easier, and, therefore, more popular than the regulation trot, and many horses get the habit in this manner, making it exceedingly difficult to break them from it, and to prevent their taking this gait when the trot is essayed on the drill-ground.

I have often drilled a troop either in line or in column of platoons, requiring the guides to conduct themselves so that they would be constantly one yard in rear of the platoon commanders, but in the proper position as to direction, holding the latter responsible for the distances and the gaits. This seemed to work very satisfactorily, and I have no doubt that the platoon commanders should be the guides as far as the gait is concerned. The touch toward the centre is the best, but unless subdivisions of columns are equalized, the side toward a reviewing officer would be very irregular unless some provision is made for guides to cover on that flank.

The horses and men do better when plenty of room is taken while marching in

line, and a small interval should be allowed, instead of requiring the touch of the boot. This would save the men from many bruises and injuries, and prevent much hard usage and consequent irritation for the horses.

Major S. S. Sumner, 8th Cavalry, A. I. G.

I have read with great interest the article by Colonel Hughes on "Revision of Gaits for our Cavalry." Any article bearing on cavalry must have an interest for all officers serving in that arm, and the subject discussed by Colonel Hughes is one of great importance. I think a great part of the uneasy and uncertain movements, observed by Colonel Hughes during his inspections, are due to the men and not the horses; the cavalry recruit in our Service is not, as a rule, sufficiently instructed; he is not taught to ride well and manage a horse, thoroughly, before being put to other drills and duties; the time and opportunity afforded at the cavalry depot can, at best, give but a smattering of the various duties required of a cavalryman in our Service; and after joining his regiment the opportunity for thorough instruction is often interrupted by other matters; the men are required and, taken up for duty, are part of the company for all drills and duties before they have mastered the elementary part of their instruction; they know, perfectly well, what is required in various movements, and understand all orders, but they cannot execute them, simply, because they cannot ride; we have no riding-halls at our cavalry posts, and up to the present time recruits have joined, and often been required for field service at once; any one familiar with cavalry knows that the greenest recruit returns from a scout an old soldier, in theory and feeling, and can never be returned to the proper status for elementary instruction. The time seems to be coming when more attention can be given to the personal instruction of the recruit; and when he is taught to ride and to be, in one sense, a part of his horse, and feel more at home in the saddle than on foot, then he can walk, trot and gallop, fast or slow, as may be required.

Taking Colonel Hughes' table of gaits in the several armies as standards, I should think the rate suggested by him for our cavalry might be attained by care and instruction, though I doubt if any considerable body of cavalry can march at a walk, for any distance, at the rate of four miles an hour, without distressing a large proportion of the horses; platoons and troops may do it on drill, and it may be well to fix that as a gait for instruction, as most horses, by careful handling, can be improved in all gaits; and particularly in the trot, I should think the rate of 250 yards per minute might be attained. Though eight and a-half miles an hour is a pretty fast trot and will never be kept up for any distance or by any considerable body of troops, a troop can only trot as fast as the average speed of the horses, and even then a certain proportion will be forced off their feet; by proper care and handling, the slower horses may be improved, and it is far better to train the slower horses than to keep the troop down to the natural gait of the slowest; for this reason it may be wise to fix the gait for instruction somewhat faster than contemplated for actual service. If we ever attain eight miles an hour and can keep it up, I imagine we should press any cavalry in Europe, notwithstanding the flattering speed shown in figures. As soon as the horses leave the trot for the gallop, the trouble begins, at least in our Service, and here, perhaps, more than in other places, is shown the weakness of our cavalry for want of individual instruction; some horses are bolting to the front, while others are lagging behind; alignments are broken and imperfect, and the solidity and cohesiveness of the command is sadly marred. I should have to make practical tests before expressing a decided opinion as to the rate set down, *i. e.*, 350 yards per minute; but whatever rate is fixed upon, it should be a decided gallop, and never a run.

I have never seen cavalry manœuvre with the platoon commander as guide, and

am, therefore, unable to express a decided opinion on such a radical change. The crowding against the guide, so often observed, is generally due to faulty instruction; the men, instead of looking straight to the front, keep turning their heads and eyes toward the guide, and the bridle hand instinctively following the eyes, turns the horse out of the true direction. I can see many reasons why the platoon commander should be the guide, presupposing that he is to remain always in front of his platoon, but as our cavalry are armed with a revolver, and as that arm, according to many modern theorists in our Service, is to replace the sabre, how is a platoon commander to remain in front or lead a charge? Personally, I have no faith in the pistol, and would be glad to see them boxed up and turned into depot, and the principle firmly established that the proper position of a cavalry officer, when mounted, is always in front of his command, except when deployed as skirmishers. I am aware that our tactics contemplate this, but officers must, of necessity, place themselves behind a line advancing with the pistol. If platoon commanders are to be the guides, perhaps the plan recommended by Colonel Hughes for determining the guide is as good as any.

Referring to the closing paragraph of Colonel Hughes' article, I have always been of the opinion that the tactics are too literally construed in regard to a touch of boot; I should say that troopers riding entirely free, with several inches between boots, is a preferable construction of the tactics; they are practically as compact as by constant rubbing of the boot, and by riding free are more comfortable and better able to preserve accurate alignments.

We have not the opportunity for instruction in large masses, afforded cavalry in other armies, but there is no reason why we should not equal, if not excel them, in horsemanship; cavalry officers should be impressed with the importance of individual instruction of recruits, and every opportunity afforded them to make each man a thorough horseman, fully competent to manage himself, his horse and his arms; when this is accomplished the further instruction in platoon, troop and battalion, becomes an easy matter. Great attention is being paid throughout the country to the breeding of fine horses, and it would seem an easy matter to provide our cavalry with good mounts; with such animals and soldiers properly instructed, we should be able to ride as far and as fast as the best.

Bvt. Brig.-Gen. C. H. Tompkins, Colonel, D. Q. M. G.

I would observe, that, in my opinion, the faulty results of cavalry drills, as set forth in Colonel Hughes' article, cannot be attributed to the men, or horses, or, in fact, to the tactics, but to the officer drilling. If the officer in command of the troop, is well instructed in his tactics, and has plenty of snap and vim, his troop will promptly respond, but if, on the other hand, he is not well posted himself, he necessarily will have to *think* slowly, and as a result the movements of his troop, will be correspondingly slow.

I think our cavalry horses, as a rule, are good, and our men generally active, and intelligent, and I very much doubt if increasing the gait, would bring about the result sought for by Colonel Hughes.

As to the additional gait, suggested by Colonel Hughes, that of "double gallop," I do not see the necessity for it, and were this gait adopted, it would be exceedingly difficult to keep a troop sufficiently well in hand, when moving at "double gallop" to distinguish from "the charge," and "the cohesion of the command," would be destroyed.

As regards chiefs of platoon acting as guides, I do not think the present tactics in this respect can be improved upon; whether the guide is right, left or centre, the trooper next the guide takes his alignment from the guide, and himself becomes a guide for the trooper next him, and so on, so that, in fact, every trooper is guide; should

the chiefs of platoon act as guides, they could not conduct their platoons properly in the rapid movements spoken of by Colonel Hughes, "preparatory to attack"—I mean the proper manœuvring of the troop for the execution of attack.

As I am opposed to changing the tactics, it is unnecessary to discuss the third point in Colonel Hughes' paper, that is "boot to boot" formation in rapid gaits.

As, probably, very many officers, who have had far more experience than I, will express their views, these few comments are intended simply as a response to your kind note.

First Lieut. John McClellan, 5th Artillery.

In this article the writer describes what he has seen, notes defects in the working of our cavalry, and then he suggests and recommends a remedy.

Does he go deep enough? Does he reach the root of the evil of which he complains?

It may, possibly, be true that by increasing the gaits—making them faster—the movement of our cavalry would be made more steadily and accurately, and the drill be much improved; but, would not a greater improvement result were greater care exercised in the training of the horses, and more time devoted to this most important work?

It has been stated that some (perhaps many) of the troops of cavalry have trained horses; horses that will stand quietly while their riders dismount and advance; horses that will lie down and allow the troopers to fire over them. This sort of training is useful, and perhaps in many cases on the plains, much more important than that prescribed in the tactics. But ought not the elementary training of the horse, to be carefully and leisurely proceeded with?

Is it not often the case, that the horses of a troop of cavalry are not properly, or sufficiently trained to the gaits?

Are they not often received by the troop just before it takes the field; or just as it commences its drill season; and are not the new horses put into the ranks too soon?

III.

"Organization and Training of a National Reserve."*

Brig.-Gen. George W. Wingate (late) N. G. S. N. Y.

LIEUT. SHARPE'S article is a carefully designed and apparently symmetrical plan for the organization of a National Reserve, but it appears to me so purely theoretical that I cannot but concur with General Slocum in considering that of Major Sanger to be the more valuable. It certainly contains more ideas than there is a possibility of carrying out. In fact, without desiring to criticise the ability and industry shown by both authors, I confess I should have liked to have seen the matter discussed from a more practical standpoint; that is to say, to develop not what is the best theoretical method of organizing a National Reserve, or what ought to be done in that direction, but what is the best thing that can be hoped to be carried out within a reasonable period.

Experience teaches me that that is very little, at least so far as Congressional legislation is to be relied upon. It took years of steady, persistent work of the National Guard Association, a body which, besides many other influential officers, included most of the Adjutant-Generals of the States having an organized National Guard

* Prize Essay, Lieut. A. C. Sharpe, 22d Inf. and "Honorable Mention" Major Sanger, N. G. S. N. Y. (See JOURNAL, No. 37.)

(eighteen of whom attended the Washington Convention of 1885), and which, in consequence, exerted no small political influence upon Congress, to procure the mere increase of the annual militia appropriation from \$200,000 to \$400,000, recommended as it had been by Presidents Grant, Arthur and Cleveland in their messages.

Even this would have been killed by the "labor" statesmen if the labor organs had known that the bill was pending. As it was, they prevented the Senate's increasing the appropriation to \$500,000, as was intended.

Remember, too, that this was a mere appropriation for arms and ordnance stores for the Militia, in which everybody was interested and no theories were trodden upon. As for the "Slocum Bill," which seeks to reform to a slight extent the present concededly obsolete U. S. Militia law, we have never been able to get votes enough in the House to pass it.

It is, therefore, difficult to see how any one can expect, that, in a time of profound Peace, the average Congressman can be induced to "hurt his record" by advocating a plan for the organization of a National Reserve. With the public mind firmly imbued with two ideas: (1.) That there are millions of Grand Army veterans in the land who "will spring to arms in an instant, and form an army which the world will tremble before;" and, (2.) That we can "raise a million volunteers in twenty-four hours superior to the conscripts of European despots;" and, finally, with the labor agitators opposing even an increase in the appropriation for the Militia, "as an attempt to crush organized labor" (*vide* resolutions of Central Labor Union, Dec. 26, 1886), and with the organized National Guard in the different States (the only armed force we have) indifferent or hostile.

In view of these existing conditions, and of the many plans for the improvement of the Militia, continually urged upon Congress by Presidents and Secretaries of War, year after year for fifty years, all of which have come to naught, and most of which have never even received any consideration from Congress whatever, the idea of Lieut. Sharpe that his plan "would be carried through the lower branch of Congress with but little opposition," seems, to speak mildly, a trifle sanguine.

The utmost that can be hoped, I think, through these discussions in regard to legislation, would be the formulation of some well-considered plan for the rallying of the National strength in time of War, which should be approved by the General commanding the Army, and be enacted, if possible, into a law, with the distinct proviso, that it should not take effect except when the President should proclaim that urgent public necessity required it. This would have some tendency, at least, to avoid the blunders, the awful waste of life and material which have been connected with the hasty calling out of volunteers in every war in which the country has been engaged; deplored by the historians of one war only to be repeated in the next. But I doubt if even this much of precaution for the future could be had from Congress.

I do not believe in the system which Lieut. Sharpe suggests, of an Adjutant-General of Reserve, with a Paymaster-Quartermaster- and Inspector-General, each with a corps of assistants. Most soldiers think there is too much of the "bureau business" at Washington already, and that its general result is apt to produce more fossils than ideas. If any system is adopted, I think it should be controlled by the General Staff of the Army, that managed a million volunteers in the late War, and manage the Army now; of course, with such extra assistants as may be necessary. Those officers would be much more efficient and reliable than those who would occupy the soft berths in the National Reserve. The detailing of a regular officer to each State as an instructor is now done, and works well.

I do not think that our country is so organized that Lieut. Sharpe's plan, if it were enacted, could be made to work. In general, as I understand it, it proposes that the

best organizations of the Militia of the States shall be induced to volunteer into the proposed National Reserve, remaining "under the control of their State for public purposes;" that when in that Reserve their general and brigade officers shall be appointed by the President, and that they will be inspected and controlled by the officers of the General Staff of the Reserve at Washington; that the time of their enlistment is to be three years, which varies from the State laws, nothing being said as to recruiting; that the States are to supply their company funds, bands, armories, lights, uniforms and arms, while the Government is to pay the men twenty-five cents, and each instructor fifty cents, for each drill; that there is to be an annual State Camp and an extra District and National Camp.

Practically, it means that the State troops are to surrender their individuality for the sake of the pay, while their States pay their bills as before. It seems to me that the State troops would be likely to decline the honor, and if they did not, the effect would be to induce the States to abstain from making the appropriations now made. If they are State troops, the State authorities would certainly claim their rights under the Constitution to appoint their officers (Art. 1, § 8, sub. 16). If they are not, then they would give them no money.*

The provision in regard to the officers would, I apprehend, be a most serious difficulty. It is clear that if they are not first-class and kept efficient, the system would be a failure. The practical National Guardsman knows the difficulty that exists in getting general officers who know their business, and how apt even these are, in time, to lose their efficiency. If anyone wants to know what kind of officers would result from "Major-Generals appointed by the President from the Brigadiers of the District," and Brigadiers selected by him from the Colonels, I would direct his attention to the Major-Generals appointed by Gen. John A. Dix (himself a West Pointer and old Department Commander), as Governor of New York, for the National Guard of that State, and that, too, at a time when experienced soldiers were more plenty than they are likely to be soon again.

I submit that experience proves that these places would be given, not to those competent to fill them, but to politicians, or men of wealth or local influence, ambitious of the title; that these would hold their stations "until 60," and if called into service, could be relied upon to the same extent as the Major and Brigadier-Generals who commanded the New York Militia in 1861, *i. e.*, not at all. Besides, the plan comes directly in conflict with the general officers and military authorities of the different States, whose influence would be fatal to it.

I fail to see where the men are to come from. The kind of men that the pay for drills would bring (if it brought any more than are now in the ranks, which I doubt), would not be good material. It is with us a rule that a National Guardsman who does not serve for love of serving, is worth but little as a soldier.

Again, the time for the proposed camps is too long. Experience has shown that even when men are paid a dollar a day, a week is all the time they can spare for a camp. Very few could devote two weeks to the district camp, and as for thirty-one days for the National encampment, Lieut. Sharpe is not as familiar with business as he is with tactics, or he would not state "that one month's vacation is about (?) as

* In fact, without entering upon the Constitutional question at length, it is sufficient to say that the power of the General Government over the Militia is expressly limited to calling it forth to "execute the laws of the Union, suppress insurrections and repel invasions" (Art. 1, § 8, sub. 15). While it is true that the next subdivision gives the power to provide for "organizing" the Militia, yet the power to *govern* them is in express terms restricted to such portions only as may be employed in the service of the United States. It is evident, therefore, that the Militia can only be "governed" by Federal authority *when they are called into active service, i. e.*, in case of war or insurrection, and that the proposed plan would, therefore, seem open to Constitutional objections.

much as the young men of to-day can secure from business." As a matter of fact, in this neighborhood, at least, vacations never exceed two weeks, and not ten per cent. of any organization could be secured to be absent from their usual vacations for a month. For this reason, if for none other, the idea of "encouraging" rifle shooting by ordering the 100 best shots in the Reserve to the National encampment "as a company of sharpshooters" does not commend itself to my mind.

I think the provision for two companies of heavy artillery to each sea-board State too small to amount to anything. I, also, think the instruction in the district encampments should be devoted to outpost duty, field marches, etc., rather than to the construction of abattis, fascines, etc., or the passages of defiles mentioned by Lieut. Sharpe. The idea of colleges and schools is good, though vague.

To sum up the objections to Lieut. Sharpe's plan (leaving aside the very serious Constitutional objection above referred to), I do not see how the passage of such a bill, as he proposes, can be secured. Neither do I see how the existing uniformed organizations of the different States, from which alone, as he very properly says, this Reserve must be created, are going to be induced to cut adrift from their States, and enroll themselves in such a body, under Generals appointed by the President and holding office indefinitely. I think that such officers would be more likely to be an incubus than a benefit. Neither do I see how the men are to be induced to perform the required camp duty. I do see an opportunity in it for an indefinite amount of clashing between the present organizations and the "Reserve," and for politics and patronage (the deadly enemies of all militia organizations), to find a foothold. It is a hard struggle, and not always a successful one, to keep the latter out of the State systems, but with the appointing power at Washington, *there would be no hope.*

The plan of Major Sanger is open to a few of the same criticisms, particularly that part of it which assumes that the system can be enacted through Congress. But it has many redeeming points. I approve strongly of his ideas of considering the Army and National Guard as a single force, establishing an Army Reserve and recruiting the Army upon a territorial system. He is also correct for the reasons above stated, and those which he states, in abandoning the idea of organizing for the Reserve any unit beyond a battalion.

Major Sanger's idea of a new force on the model of the English militia, to occupy a position midway between the State National Guards and the Army, and whose annual military instruction should consist of four weeks' continuous service under pay, did not at first impress me as one that could be carried out. It is so clearly impossible for the class of business men that compose the National Guard, in this section of the country, to spare that time, that I was, at first, inclined to think that the men could not be had; but, on inquiry, I think that this is an error. While it is true that business men, and men having families or permanent employment could not serve, there is a large class of young fellows, the material that would be the first to enlist in time of War, who float around from job to job, and would not dislike the idea of a month's service during the summer at a good post, if well paid. They would not be as amenable to discipline as the National Guardsman, and would have to be handled kindly but firmly. But, with proper officers, and practical drill on the German system of "teaching in Peace nothing but what is required to be done in War," a good deal could be done with them in a month, particularly if they were brigaded with a regular detachment. I see no reason why a good start might not be made with such men toward a few heavy artillery regiments for our forts, if we had any guns for them to be trained to use (which I am inclined to doubt).

The National Guard is, and is likely to be, more a training-school for officers than of musket-carriers, mere "food for powder." Such a force, as Major Sanger indi-

cates, would do much to train a body for them to command, who would form a nucleus for the rank and file of our volunteer organizations in case of War. But I do not think the right kind of men could be had unless the pay was higher than that of the Army.

Major Sanger's ideas in regard to officers are sound, except that I doubt the expediency of a Retired List, unless it is made conditional upon efficiency being maintained, as by passing an occasional examination, say every three years. His idea of classes of instruction at the forts, and of militia officers being attached to the Army for a given period, and to attend the Army schools of instruction, etc., are correct and practical. Whether Congress should organize the National Reserve or not, such plans as he suggests in this respect would be valuable in raising the standard of knowledge among our National Guard officers.

I also approve of his ideas as to manœuvres, particularly that part of them which looks to marches of two or three days, of a combined force of the Army and National Guard, but carefully considered beforehand.

As it is easier to criticise than to create, I think it is but fair that I should offer myself to criticism by making some suggestions, which, of course, must lack the careful thought that characterizes both papers under consideration.

The first way to organize a National Reserve, in my judgment, is to reform the Army. The scattered posts should be abandoned and the troops concentrated. The soldiers, instead of being what they are, should be men of good character, enlisted from the same neighborhood, and provision should be made for their discharge upon proper terms. They should not be employed as laborers (I know a case where a man has been re-enlisted some three times who is utterly useless as a soldier, because he is a good painter !), but trained as German soldiers are, not only drilled in every branch of practical duty required in war, but have their bodies developed by gymnastics and their minds by study. Neither should they be left to the tender mercies of the sergeants, but be taught and treated as Prince Hohenlohe describes the Prussian Guards as training their recruits. The officers should also be taken in hand. Not only promotion, but retention of commission, should be conditioned upon efficiency. This is the rule in other pursuits, and there is no reason why the Army should be exempt from it. "If a man will not work neither shall he eat," is even the Bible rule. The Science of War should be taught and practised in the field as well as in garrison. Some provision, also, should be made to encourage and recognize special ability and industry ; something to retain the bright, ambitious, young officers in the Service, and prevent their ambition and desire for improvement from being ground out of them, as is now so often the case. With this done, there would be a body to serve as a model for a National Reserve ; a nucleus not only ready for almost indefinite expansion, but one, too, which would stand so high in the public estimation, that it would be an honor to be enrolled with it, even temporarily.

But does any one think that, as the Service is to-day, the parents of the young men who compose the State troops would consent to their sons being closely associated with the rank and file of the Army, or that such association would not be apt to be contaminating ? There is also considerable doubt, as the Army is now situated, as to the number of officers in it who are fitted to become general officers of the Volunteers or National Reserve in time of War. Conceding the solid foundation of a West Point training, there is no magic which takes it out of the rule, that while a collegiate training in a profession is valuable as a preparation for future study, unless such study is maintained, the graduate falls behind the man who, without his earlier advantages, makes up for them by subsequent application. It is difficult to see how officers who have spent their time until middle age with a command which averages less than 20

men for drill, and who have scarcely seen 500 men under arms together, with no course of study exacted by their superiors, and their ambition dulled by the impossibility of promotion or reward, can maintain that fertility of resource and elasticity of mind required for a large command. Many think that a bright civilian, who has worked from the ranks to the command of a company drilling 75 intelligent men; who is trained in all that a first-class regiment can be taught in the Armory and State camps; who has passed an examination for every position he has occupied, and is an eager student of all military topics—such a man as General Terry was before the War—is not so far inferior to the old Regular above mentioned, that the latter can teach him very much in the duties that he needs to know, except, perhaps, in a few practical details of feeding, marching, and bivouacking his men.

I think the foundation of a National Reserve can be gradually and firmly laid with very little legislation, and that it is better not to rely upon the latter but to try what can be done without it. This is, after all, the American plan, that initiative should come from the people themselves; this has been the process of evolution of the State militia organizations which now excites very little jealousy, and manages to secure good appropriations from the State. When, in 1878, I inserted a section in what was afterwards known as the Slocum bill, looking to the detail of regular officers, on request of the Governor of a State, as Chiefs of Staff, Adjutants and Inspectors of the National Guard, it met with such universal denunciation, as to cause its summary withdrawal. Yet, now, a regular officer not only serves as Inspector in every State Camp, but others act as instructors in rifle practice to the Guard of various States, and another (Lieut. Hamilton) is doing invaluable work in New York as an instructor in Minor Tactics and Customs of War.

Let this course be followed, and the bright young officers of the Army, used to instruct and stimulate the National Guard, and, in so doing, become accustomed to deal with large numbers of volunteers, and thus will be taken out of the "Army rut."

General Drum's excellent idea that civilian appointments to the Army shall only be given to successful competitors from the National Guard of the State, would be another step in the right direction. Perhaps the best and most far reaching plan for the improvement of the State National Guard is that of General Schofield, to invite a detail of National Guard officers to serve in the marching column that he proposes to send out for instruction in practical field work. This is just what the National Guardsmen want, and the offer would be jumped at.

Let little "march-outs," of one or two days' duration, be planned to take place, wherever there are any Regulars, and a few National Guard organizations be invited to unite with them, which they will do. Then let their field and staff officers ride over the ground with a Regular instructor, and be shown how to make field sketches. Let them be encouraged to plan out and discuss, with their company officers, the details of the movements for weeks, if not months beforehand, having their ideas criticised and the matters explained by an army officer, so that they will thoroughly understand what they are to do. Let there be examinations of the regular officers, and let the officers of the National Guard be encouraged to compete, as in England, and let the names of those who pass be published in the Army Register and in State General Orders, as qualified to hold a corresponding commission in the Army. Let a heavy gun be mounted for practice, in each city where there is a regiment or more of the National Guard, and cause the men to be occasionally drilled in its use in the evening, under the supervision of a regular officer, and lectures given them upon the simple matters of artillery instruction.

None of these things require any legislation or any particular amount of money (except perhaps the latter). They can be put into operation whenever the General

commanding the Army chooses to put himself into communication with any one of our leading State Adjutant-Generals, who would be only too glad to co-operate. Thus, step by step, without exciting any prejudice or bothering with Congress, the National Guard can be infinitely improved with a corresponding improvement in the Army, and not only would the country be willing to provide an increased expenditure for the needs of a Service thus shown to be more efficient, but the two branches of the Service would each learn from the other some things that it is quite important for them to know. In addition, the volunteer emulation and co-operation of National and Regular officers, and organizations, will accomplish more within ten years than all the attempts at imposing schemes of Federal legislation have effected in a century.

Brigadier-General Albert Ordway, D. C. Militia.

In their admirable papers on a National Reserve, Lieut. Sharpe and Major Sanger agree that the existing Volunteer Militia organizations of the respective States, are the most available basis for such a reserve.

Lieut. Sharpe says, that, while a new National force "would possess many obvious advantages," that its creation "seems to be wholly and utterly impracticable," and that "the only practicable organization which can be availed of, under our form of Government, with our kind of people," is the Volunteer Militia that now exists.

Major Sanger admits, as his opinion, "that the Militia can be so organized and trained as to become a most efficient force for National purposes, * * * and, that, before any new force is created to take its place, an effort should be made to develop the Militia into a National force."

Both writers, it seems to me, fail to carry their conclusions to a legitimate result by pointing out a practical way by which the existing State organizations can be transformed into an effective National force. Lieut. Sharpe says that "it can only be accomplished by, and through, a mutual agreement between the Government on the one hand and the States on the other," and leaves the matter in abeyance at that point; probably, realizing that there is no known method or authority by which States and the Federal Government can enter into a mutual agreement of any kind. Major Sanger comes nearer to pointing out a direct method by which the desired result could be effected, but he fails to state it explicitly and in detail; and in his premises admits that any change in the Militia, "to be successful, must have the approval of the men who constitute it."

Those who have carefully studied the subject, agree that it was intended by the framers of the Constitution, that the Militia should constitute a National force, with only a very limited control over it by the States, and that the Federal Government has never exercised, or attempted to exercise, the full extent of the power conveyed to it by the States in framing the Constitution. Major Sanger evidently believes in this theory as he alludes to the point explicitly and reverts to it several times in his argument. But while rights and powers may have "not been lost by non-use," it is a practical question whether it would be good policy to assert powers that have been dormant since the time they were granted.

The fact that the Federal Government, by a permanent annual appropriation, furnishes arms, equipments and uniforms to the States is sufficient evidence that the force to which they are supplied is assumed to be a force being trained for the "common defence," and not a reserve police force of the States. Major Sanger is, evidently, unaware that, under the last amendment to the militia law, a State can draw from the Federal Government any article contained in the list of supplies furnished to the Army, as he states, as one of the existing needs of the Militia, that the National Government should supply them with uniforms and overcoats.

It seems to me that the results so earnestly and ably advocated, by both Lieut. Sharpe and Major Sanger can be accomplished in a very direct and practical way without any mutual agreement or concession, and without any elaborate agreements or fine drawn distinctions as to the respective powers of the Federal Government and the States over the Militia; and, that is, by an appeal to the most powerful of all motives—the selfish, rather than the patriotic.

All agree that it is an absurdity, that the obsolete Militia law, with all of its cumbersome and forgotten provisions, for an enrolled militia, should continue to remain upon the statute books. Many unsuccessful attempts have been made to replace it, but the time seems to have come, that is possible and practicable. Without discussing any details to be advocated in framing a new law, and effecting the results advocated by Lieut. Sharpe and Major Sanger, I would simply outline them to be :

1st. That the law should recognize and provide for the volunteer, or active Militia, and only incidentally for enrolled Militia.

2d. That the annual appropriation for furnishing arms, equipments and uniforms to the Militia should be increased.

3d. That the appropriation instead of being distributed, as heretofore, among the States according to the number of their Representatives in Congress, should be distributed according to the number of their organized volunteer Militia.

4th. That the law should contain all the provisions deemed necessary by the Federal Government for training and maintaining the Militia for effective National use when necessary, embodying many of the excellent suggestions made by Lieut. Sharpe and Major Sanger. Simply providing, that if the State does so and so, it shall be entitled to receive aid from the Federal appropriation, and if it does not do the things specified it can go without the aid of the Federal appropriation.

If a State wants to maintain its volunteer Militia, simply for its own police service, let the State exclusively pay for it. I think there would be little doubt about the result of such an application of the Federal appropriation. Such a law, while it would be mildly coercive, would eliminate all debate as to the exact force of the provision of the Constitution, "preserving to the State * * * the authority of training the Militia according to the discipline prescribed by Congress." The plain, practical, business sense of the people and of the State authorities, as well as their awakening sense of the future dangers that menace the country, would make them very quickly put the training of their militia in the hands of the General Government, for a specified time, in each year, and submit to all other detailed requirements deemed necessary, if their receiving their allotted share of an annual appropriation was made contingent on their doing so.

One reason why all recent attempts have failed to substitute living law for the present obsolete statute, is that there has been no unanimity of opinion as to the changes desirable, and no unity of action in attempting to obtain them. Congress has neither time, inclination, nor ability, to originate a militia law, and it has taken refuge in inaction amid the multiplicity of theories submitted to it. If the National Guard will take up the valuable suggestions made by Lieut. Sharpe and Major Sanger, together with many that have been proposed by others, and formulate a bill that every National Guardsman will agree to support, and, in supporting, waive every personal prejudice and pet theory overruled by the majority, we believe that they can secure the enactment of a new militia law, and that Major Sanger's assertion can be verified, "that the Militia can be so organized and trained as to become a most efficient force for National purposes."

Bvt. Brig.-Gen. W. W. Burns, Colonel Subsistence Dept.

The question of organizing military reserves in time of Peace, for immediate use in time of War, is attracting much attention, in view of the unprotected condition of our sea-board cities, and the fact that Europe is prepared for War on an immense scale since the Franco-German War of 1871-2. Our Constitution, which has won the admiration of the world, is based upon Peace, and the aphorisms of its founders, such as, "No entangling alliances with foreign powers;" "In time of Peace prepare for War;" "A well-disciplined Militia is the palladium of a Republic," etc. The Constitution says, "The Congress shall have power to declare War, to provide for calling forth the Militia, to execute the laws of the Union, suppress insurrection, and repel invasion." To provide for organizing, arming, and disciplining the Militia, and for governing *such parts of them as may be employed in the service of the United States*, reserving to the States, respectively, the appointment of the officers and the authority of training the Militia *according to the discipline prescribed by Congress*. "The President shall be the Commander-in-Chief of the Army and Navy of the United States, and of the Militia of the several States, when called into the actual service of the United States." As the Army is the creature of Congress, and the Militia that of the States, it is clear that no National Reserve was intended otherwise. All plans for organizing military forces must be subordinated to the above conditions, in conformity to our fundamental law. Each State is authorized by it "to maintain a well-regulated militia, it being necessary to the security of a free State." The word "Militia" is, therefore, a Constitutional word, and when Thomas Jefferson substituted "well-disciplined" for "well-organized," he perfected it, and designated the best troops in the world. It is a better word than "Volunteer," for it means equal justice to all. Each able-bodied citizen is enrolled, and is bound to serve the State, because he is protected and is a patriot. Now, the question of organization, discipline, and drill is left with the States, with the proviso that the method is to be prescribed by Congress, to make it uniform with the Army. The painful fact that the militia system of the Fathers has proved a failure, is due to the absence of the teaching of discipline, which alone makes the soldier; *i. e.*, discipline according to the principles of the Art of War. That discipline will be reached only by removing the Militia from the domain of party politics, and placing it under the ægis of patriotism, where it belongs. The principles of the Art of War are scientific principles, and are to be learned only by deep research and hard study. It is conceded that the military profession includes all professions, and as it is so hard to learn, the average professional ignores the study, and claims his fitness for it as divine or born with him. Branches of it may be learned by practice under proper teaching. The drill is mechanical, like dancing, yet requires a master who himself was taught by a higher master than practice. How is the Militia to get this training that sets up a soldier? In the rural districts the children have schoolmasters to teach them the rudiments of learning; the Militia must also be taught.

A "well-disciplined" militia has, heretofore, been a contradiction, but the fathers of the Republic made few mistakes, and the "well-disciplined" was a proper adjective to "Militia." Since the Militia is recognized by the Constitution, and all our laws have grown out of the fundamental law, these laws must be adhered to. By them every citizen, between certain ages, is bound to serve the State, and is enrolled as militia, as he is bound to serve as a juror. The question that remains, is to have this militia well-disciplined and drilled, in accord with the rules prescribed by Congress, which are those for the Army, and are drawn from the advanced principles of the military art. There is but one centre from which these principles are obtained in the Republic, and

that is the institution founded by the Father of his Country, who had sorely felt the lack of these principles in his many military disasters.

Congress provides that the Governors of the States have the authority of training the Militia, according to the discipline prescribed by it. This discipline, perfected at the Military Academy, which was intended as the school for the military training of the people, should be at the disposal of the Governors of the States, to insure a well-disciplined militia. The appointments to this school, from the children of the people, are made from the selections of the members of Congress for their respective districts; each district, one. These cadets, when graduating, do not lose their citizenship by being appointed to offices in the Army, and should maintain their support to the people whom they serve, to carry out the intention of the framers of the laws, and be utilized to train the Militia of their districts according to the discipline prescribed by Congress. As the President can only command the Militia when called out, the Governors must be authorized to request of the President the services of the district graduates for discipline, in the short seasons each year in which the Militia may be required to train. The Governors would commission them to command battalions and companies in their districts, in order to teach, drill, and discipline the Militia, otherwise officered as the State laws direct. This would form a connecting link between the people and the Army, and give such confidence to the Militia, when knowing their discipline was of the latest approved methods, that when War broke out, thousands of sick, and millions of money, would be saved, and the Militia would take the field, armed, equipped, drilled, and disciplined.

The Governor of Ohio appointed the writer, Asst. Commissary-General of Ohio Militia, when serving as Chief Commissary of the Dept. of the Ohio, in 1861. There has been, heretofore, an unfounded jealousy against the Military Academy and its graduates, which would disappear when the people could have some use for them as teachers of the military art. Volunteering ceased in 1863, and large bounties, costing millions of dollars, became rewards for bounty-jumpers, until drafting had to be resorted to, after losing the best material of the people in hospitals. It would have been far better and more equal to have followed the rule laid down in the fundamental law, and had the Militia disciplined into soldiers of the country to fight its battles.

In the cities, uniformed associations will continue to make defences through their voluntary organizations, but each Congressional district should organize its militia. Enrolled with arms, accoutrements and camp equipage so that a time in the spring and fall may be appointed for them to meet for militia exercises, under the direction of the several graduates of the Military Academy, from the district, who have been appointed by the Governor, to suitable rank in the State military, to authorize the right of command. Then, another time may be appointed, when all of the officers from the districts in the State shall meet, and all the graduates from the Military Academy from the State asked for to instruct the militia officers in the higher branches of the military art. These battalions divided into companies, troops, or batteries, will be thus instructed, so that the captains can continue the drill, and discipline in their localities until the next meeting. The term of service of each company to be determined by its efficiency as reported by an inspector appointed by the Governor from the graduates of the Academy, when a new company may be organized in the locality. It is futile to suppose that any of these organizations, entire, will be expected to take the field, as such, when the President calls for troops, in an emergency, but the material will be ready, and under whatever organization called out, will have the *esprit de corps*, discipline and drill, to soon become effective. Then the Governor will know the officers of the Army from his State, whom he can ask the President to lend him for the commands in time of War. Thus all of the States will be represented in the

Army, proportionally, and the Army will be homogeneous in discipline, drill and movement, and the military science of the nation will lead it into the field, armed, equipped and sheltered.

Where is the community which would not kindly welcome its representative from the National College or Army among his relatives and friends, when called for by the Governor of his State, to instruct the local Militia in the art he had learned at College? Who is the graduate who would not gladly visit his home and assist his father's friends and neighbors to learn his profession to the extent of enabling them to defend their hearthstones, or go forth at the Nation's call to defend its liberties? What mutual benefits to individuals, how harmonizing between State and Nation, how beneficial to connect the Militia with the National Academy. Did the Fathers build better than their successors know? The Constitution should be the Bible and the Republic. The Militia has gone into desuetude through lack of proper discipline, which rendered it ridiculous. The writer, when a boy, called it "cornstalk military," as that was the prevailing arm. His father was the Major-General, and, on one occasion, held what was called an Officers' Muster. The boy had raised a stalk of Baden Baden corn, eighteen feet high, and with seven large ears pending, and on this occasion rigged it upon a board supported by two rails, and at an opportune moment, four boys brought it upon the plain, before the astonished ranks, with their significant trophy. The ranks broke, and the multitude rushed to see the grand specimen of agricultural growth. Since that time he has seen why he wanted to put the Militia into ridicule. It was their want of the knowledge which makes discipline, and is the pride of the soldier,—they were ashamed. Think of it, the Constitutional defenders of home and liberty ashamed of their military organization, and discipline, for the want of teaching!

As our institutions are based upon equal justice to all, the organization cannot be formed upon any European plan, and as an Army is a necessary evil in a Republic, its organization must not be far removed from the people's control. It should rest with the States until necessity calls it into service. The method of enrolling naturally demands, that only able-bodied men, and those best spared from the producers should enter the ranks; hence, a tax levied upon the exempt would support the organization in pay, equipments, etc., and prevent favoritism. The result would be, that the service in drill and discipline would be well-nigh voluntary, because popular and healthy exercise. The graduates would, naturally, seek to be acceptable to the people of their districts, and would endeavor to arouse an *esprit de corps*, and healthy rivalry with other districts, as to efficiency and soldierly bearing. There is no exercise better adapted to develop the muscles, and set up the body. The professional and tradesman, have developed some nerve or muscle at the expense of others, and the system is not in equipoise. It has been observed by medical men, that army exercises, correct all abnormal conditions, and restore manly vigor in all the functions. They enliven the spirits, and arouse a sense of personal pride, which, if properly directed, induces all young men to prefer them. The colleges, which now have military practice, have found it difficult to restrain their pupils from giving too much time to it. To keep alive the military spirit belonging to our people, is to enoble their natures. Now, that field sports, hunting, etc., is not practised, a new channel, other than useless games, should be found if they would not become enervated and sink into effeminacy. Unfortunately, ambitious politicians will oppose any system which would take the offices from their control, but the Nation's defence must be upon a higher plane, and skilled leaders preferred to ambitious pretenders, in time of danger to the State. Politics of the lower plane should not be tolerated in an Army, whose duty is to defend the honor of the Republic, and the lives and property of all its citizens.

Properly disciplined, our soldiers could have no superiors. Our system is based upon

jealousy to standing armies in time of Peace, and we have, therefore, one so small as to be unavailable in a crisis. But the skeleton army, with a surplus of officers educated to teach, may, in turn, teach our citizen soldiery to be ready for any emergency, if a true system be adopted, carried out as Washington intended, and Jefferson implied by his "Well-disciplined Militia"—since how could a well-disciplined militia exist without educated military men to teach the discipline of the Art of War? Our common schools do not teach the Art of War. It cannot be picked up in the ordinary pursuits of life. The disposition of the successful soldier to claim that he was a born soldier will not bear investigation. The chances are, that the born soldier would naturally seek, when a boy, to lead a military life and education, so that a fair proportion of these unfledged heroes would find their way to West Point—for it is education that forms the mind.

But it is submitted that it cannot be learned in a day, nor as easily in advanced life, and it's costly education in time of War, in the price of sickness, blood and treasure. It had best be learned in time of Peace, at a school which is thorough and national, under the control of carefully drawn laws, requiring the broadest studies, and, thence disseminated through the channels of Congressional districts, amongst the people who supply the pupils to the National school, so as to complete the circuit of interest, and cause the Representatives in Congress to respect the representatives in the Army. The people will then know their Army and respect it, which is now, unhappily, far from being the case; on the contrary, evil prejudices exist against it everywhere. The present State military organizations have lately begun to ask the Secretary of War for the presence of army officers at their encampments for the purpose of inspection and criticism. Thus far it has worked well; but it is not pleasant to be inspected and criticised, and if adverse, is likely to be resented, if too favorable, not respected. The true plan is to have mutual responsibility and common interest, such as teacher and learners. It is not a good outlook to see our people turn away from our Constitution and the aphorisms of our Fathers of the Republic. When that glorious government of the people was adopted a hundred years ago, many of an aristocratic tendency opposed it, and more accepted it in a half-hearted feeling. Ever since it has been resisted, when it was safe to resist, or evade it. The provision for the Militia was ridiculed by that class as compared with the British Army, until, by the neglect of discipline, it has been sneered out of sight and use, and, unfortunately the Military Academy contrasted instead of assimilating with it. A free religion, free speech and free press has been maintained against the same aristocratic tendency, because of the vigor of their advocates. Why should not the Militia, styled by the founders as the palladium of liberty, be respected, and as the Constitution has immortalized it, be preserved as one of the fundamental principles of the Republic. Let it be joined to the Military Academy, the foundation of Military Science, so that the stream of military knowledge may flow from the source throughout the channels to the great river of the Nation's welfare.

The Militia is intended by the Constitution to be a force for the State and for the General Government jointly, to suppress insurrections or repel invasions in the State, or in the United States. "We, the people, etc., to provide for a common defence." The State would seldom require its use in large bodies, and, therefore, the expense and interest for its regulation and organization must be a matter of care for Congress, to encourage and assist the State, otherwise the State, in time of Peace would allow it to disintegrate, as has really come to pass. As the United States can rely upon no other resource, its safety will depend upon the stimulation of the State, to the exertions for the general welfare. To do this, instruction, money and material must be tendered to the State to foster this State and National force. A mutual understanding and assistance is demanded in this, more than in any other, relation between the States and the

General Government. It is strange that this mutual case has been so long neglected. The over-confidence of our people, in their security, can alone be assigned as the cause. Bravery, without organization has never shielded a people against organized force.

Let the Congress resolve that: *Whereas*, the Constitutional military reserve force of the Nation, is confided to the Militia of the States, to be called forth in the exigency of War, and this is the only force, except the Regular Army (kept at a minimum of strength in time of Peace), upon which the Nation can legally rely upon for its defence. And, *Whereas*, it is well-known that the Militia of the States is not organized and disciplined in a manner to meet a military emergency, therefore, *Resolved*, that the President by proclamation, may call the attention of the Governors of the States, to the fact, and, in consultation, devise ways and means by which the Militia may become disciplined, drilled, armed and equipped, to meet any emergency which may fall upon the Nation. Then laws may be passed by Congress to give such aid, in arms, material and tactical literature as may be required to build up a perfect organization, having the National Military Academy in connection with the people who support it through its "élèves" acting in the capacity of citizen-soldiers of the Nation and State.

Reviews and Exchanges.

Modern War.*

A SUBSTANTIAL volume, pleasant to handle and easy to read. Manifestly, the author has been fortunate in his translator and in his publisher. Binding the maps in a volume by themselves was a happy idea. Where the text and the maps have to be studied together, there is nothing more exasperating than to have them bound in one volume.

The dawn of what might be called a new era in the Art of War took the world by surprise in 1866; and, in spite of that warning, France found herself unprepared to meet it in 1870; not that French officers had been altogether blind to the new departure. General Trochu appreciated its full significance, and tried to arouse the French nation to a realizing sense of the impending danger. But General Trochu was not a favorite with the Emperor, and at that time the Emperor was France.

The author's position in the School of War in Paris, no doubt gave him special advantages in preparing his work. Perhaps it was his duty to search out the causes which led to the disasters of 1870 and 1871, in order to put the young military minds, under his command, on their guard against them. At any rate, he starts out boldly with the confession that France owed her disasters to "ignorance of the new processes of War."

Naturally, that admission whets our appetite, and we expect to find these new processes the key-note of every paragraph. In this, however, we are disappointed. A glance at the introduction shows us that the new subject is divided up along the old familiar planes of clearance, and treated in the old familiar way. But this, perhaps, is not to be wondered at. The principles of strategy are unchangeable. What they were in the days of Julius Cæsar they are to-day, and all that we can reasonably expect on such a subject is, new methods of application.

In opening up his subject, the author glances at some of the more recent definitions of strategy, but, finding none of them entirely to his satisfaction, finally concludes, wisely, no doubt, to adhere to that of Jomini. How many military authors have been driven to the same course, not because Jomini's definition was entirely satisfactory, but because of the difficulty of devising one for themselves. This difficulty arises, in some degree at least, out of the fact that they ignore one-half of the art. All problems in strategy contain a psychological element, which soldiers are exceedingly shy of. They feel that it is a difficult subject to handle, and, therefore, ignore it. The strategy of the text-books is a body without a soul—a mechanical automaton, which a child might understand. Real strategy is a mystery to all but a very few. To only one or two minds in a century is such spiritual insight given. Strategists are born, that is, real strategists; the ordinary kind, perhaps, can be educated.

* *Modern War*, by V. Derrecagaix, Colonel d'Infanterie Breveté, Commandant en Second l'École Supérieure de Guerre. Paris. Translated by C. W. Foster, Lieut. 3d Artillery, and published by James J. Chapman, Washington, 1889.

Napoleon was a master of strategy. He was the greatest actor the world has ever seen, and a mystery to everybody. He recognized the psychological element in the art, and he practised upon that element with such consummate skill, that in many of his campaigns he may be said to have commanded both sides.

The fact is, strategy is closely akin to the art of the thimble-rigger. The difference is in degree. The strategist manipulates armies or army corps, instead of thimbles, and plays for higher stakes; but success depends, in either case, upon the player's ability, not only to deceive his adversary, but to make him feel so sure that he is right, when he is wrong, that he rushes eagerly to his own destruction.

In the thimble-rig, if the adversary could see nothing, he would have one chance in three to win. It is seeing that ruins him. He gets a glimpse, accidentally, as he thinks, and is sure of success. But he is always wrong. And it is just so when an ordinary strategist meets a master of the art. He gets a glimpse of something, and reasons on it, sharply and shrewdly enough. The master will never take him for a fool, unless he is one; he has diagnosed his mental calibre, and knows precisely how he will reason on given premises, and how he will decide. His art enables him to give him the necessary glimpse, properly conditioned and circumstanced, and the machinery of his brain is set in motion. The master quietly awaits the result in perfect confidence; he knows what it will be.

There is no better illustration of this than the campaign of Marengo. When Napoleon arrived at Ivrea, he found himself in a predicament. At that point he must turn eastward to Milan. He must abandon his line of retreat; and should he be discovered before he got across the Ticino, and secured a new line of retreat, he was lost. Then it was impossible to force the passage of the Ticino without being discovered. That was the situation. This was the solution. Lannes' Corps, without artillery or baggage, was sent down to the Po, as if to cross. They were to seize all the boats they could find, and fight anything and everything that might turn up. This was the glimpse that set Melas' mind a working. He watched them carefully; Napoleon knew he would. He noticed they had no artillery, and no baggage. Napoleon knew he would; and his thoughts, in all probability, took such a course as this; O, Yes; but you can't fool me. You have no artillery and no baggage; you are ragged and foolish, and making too much noise to mean business. You are some detachment which that young man Napoleon has sent over the passes to attract my attention. But you shall fail. The Little Joker is on the Susa road.

Napoleon waited the result of this mental struggle with great patience, one whole day, hidden in the woods about Ivrea. He knew what the result would be, and when he saw Austrian battalions moving from the east to the west side of Turin, he knew that that result had been reached. He then started toward the East in perfect confidence.

We find nothing requiring comment in the introductory chapter, unless it be the opinions of General von Peucker, which are quoted at some length, probably because they are Prussian, certainly not because they are new.

War is well defined as "a method of compulsion, used by one nation against another." But when the author proceeds to restrict the scope and character of that method by something akin to prize-ring rules, we refuse to follow him. War is not "*a duel between nations*." On the contrary, it is a desperate struggle between a would-be peaceable nation, and a highwayman. The would-be peaceable nation is fighting for its life, and will not be bound by rules. Of course, the laws of humanity are equally binding on both, but each is responsible to his own conscience alone.

In the chapter on organization, we find little calling for comment. We find, however, what may be found in almost every treatise on the Art of War, that the author

cites the same historical incident, as an illustration of entirely different principles, giving the incident a little twist to adapt it to the new situation.

Thus, under the caption *Decision*, which the author permits to change into *Tenacity* and, ultimately, *Obstinacy*, he cites an incident in the battle of Königgrätz as an illustration. He says, the 7th Prussian Division, perfectly isolated, was attacked by two Austrian corps, but maintained itself in the most heroic, and even obstinate manner, until the Prussian Guards, coming up saved it from annihilation. The Guards, he says: "Taking the Austrian masses under fire, extricated Gen. Fransecki," page 71.

On page 83, however, we have a different version of the story. There the author is discussing *Hesitation in the execution of orders*, and says that the two Austrian corps on that occasion, having been ordered to take up a certain position, permitted themselves to be drawn into a violent encounter with the 7th Prussian Division, "and wasted most of their forces in this unprofitable struggle." And when their success was certain, and the total destruction of the Prussian Division assured, Benedek gave orders to the two corps to return to their position.

The incident, no doubt, affords an excellent illustration of tenacity on the one side, and disobedience of orders on the other; but the incident should remain unchanged. Either the arrival of the Guards saved the division, or it did not. In fact, it was not necessary that the division should be saved at all. The incident would have been an admirable illustration of tenacity, even if the division had been annihilated. And it was not vain tenacity either, for it completely broke up Benedek's plans on his right.

Again, in discussing the *morale* of the French Army under Dumouriez, he quote from General Blondel, as follows: "The passion for glory and liberty," enabled the soldiers of regenerated France "to conquer and drive from the sacred soil of France, the trained Generals and veteran troops which united Europe brought against us," page 87. Now that is simply rhetorical bombast.

On page 189, however, we get the facts. He says, speaking of the occasion referred to above, that, "An Army could then traverse it—the Argonne—only by five passages, all of them constituting dangerous defiles." The occupation of these defiles by Dumouriez, and the season of the year, compelled Brunswick to withdraw.

Why the quotation from General Blondel was admitted into a professional work, would be a hard question, even for the author to answer.

Under the caption "Preparation for War," the author discusses the importance of studying the theatre of proposed operations in advance of hostilities, and illustrates the character of the reconnaissances that should be made by quoting the instructions of Napoleon to General Bertrand, dated Camp of Boulogne, 7th Fructidor, year XIII. Now excellent and comprehensive as these instructions are, surely something of more recent date, something that recognized the existence of railways, telegraphy, photography, and other sciences, might have been found to illustrate the requirements of ante-bellum reconnaissance work in a treatise on "Modern War," written in the year 1888.

On page 160, we find the following, which is excellent: "A well-planned system of railroads. . . . constitutes . . . an instrument of defence, more efficacious even than fortresses." We endorse every word of that statement. but the author does not seem to be at one with himself on the subject. On page 194, he admits that "countries like France . . . have been obliged to cover themselves by fortified works and intrenched camps." "Armies," he says, "can no longer invade a country without taking into account these powerful obstacles." And a little further down the page, he says: "Yet it is not probable that these places could stay the invader."

In discussing the military importance of railroads, the author quotes liberally from Von der Goltz, who maintains that "their employment cannot affect the movements

of armies in course of operations," or modify "the application of the principles of strategy." They enable an "army to rapidly draw to itself disposable troops" from considerable distances for the purposes of battle however—page 161, which it would seem, must, in some degree, affect that principle of strategy which enjoins superior concentrations against an adversary.

On the subject of road reconnaissances, the author commends what is known as the German method, and insists—page 167—that there should be, "as a part of the general staff, a permanent traveling service for foreign countries." And he might have added for home countries also, for war cannot always be kept beyond the frontier; nor can any General be perfectly familiar with every corner of his own country. In this connection, too, he quotes as samples of the work to be done, Napoleon's instructions to General Savary, which, in spite of their excellence, might have been supplemented, somewhat, by instructions of more recent date.

Rivers as means of communication, receive cold consideration. On page 175, we find it stated, that in 1866, 1870 and 1878, "Armies made but little use of river communications." Now that may be quite true, but the fact is not conclusive against river communications in general. The rivers may not have been suitable in the campaigns cited. Certainly, during our War, navigable rivers constituted the very best lines of communication, and to an American, it seems rank military heresy to teach the contrary.

Rivers as military obstacles, receive full consideration, and the author reaches the conclusion, that the passage of a river in the face of an enemy is one of the most difficult operations of War—page 178. After numerous quotations and citations as to the great difficulty of forcing a passage, or effecting it in any other way than by surprise, he says—page 185, "It never happens that the defender can long prevent the successful crossing of a numerically superior enemy." This and the preceding statements on the same subject are all within inverted commas, and are given as "The theories held by the Germans," meaning, perhaps, German writers on the subject. Such conflicting opinions can hardly have the sanction of the German staff.

Mountain ranges, whether parallel to the line of invasion or at right angles to it, are favorable to the defence. On this point the author quotes from Blume. He says, also, that hilly and woody regions, and natural military positions, like Plevna, are similarly favorable. We might object to calling Plevna a natural military position, but as these subjects are to come up for full discussion in the volume on Grand Tactics, we postpone the objection.

But here we have an assertion which we are bound to dispute. "Strategy," he says, "remains independent of the character of the ground." We would ask, could the strategy of the Marengo campaign have been possible without the barrier of the Alps, and the woods around Ivrea? Strategy, on a perfectly level, roadless, riverless, treeless plain, would be like the thimble-rig without the thimbles.

We read, on page 194, that intrenched camps are the modern form of frontier fortifications, and countries like France are obliged to resort to them. But the author quotes approvingly from *Blume*, on page 196, that "It should never be lost from view that great and decisive results are obtained in the open field alone." To be sure he also quotes from *Von der Golts*, on page 197, that "The French have almost solved the problem of barring all the roads of invasion;" which must be very comforting for a Frenchman to read, considering the source from which it comes. Still, the author declares, on page 199, that frontier fortifications are only temporary expedients, intended to bridge over a period of temporary weakness, and that France maintains them now as a kind of guarantee that she "has no intentions of attacking her neighbors." We have not quoted literally, but given the substance, and must add that we

are a little in doubt as to the author's meaning ; especially when we read the quotations from a Prussian field officer, which follow immediately after, and, seemingly, with the author's approval.

The discussion of *strategic points* and *objectives* presents nothing decidedly new, or calling for criticism or remark. But *strategic lines* cannot be passed over so lightly. We find the subject divided up under the captions, *Bases of Operations*, *Fronts of Operations*, and *Lines of Operations*, and we object to the nomenclature because it is confusing. This will become apparent when we consider the fact—also mentioned by the author—that in military railroad parlance, *Base of Operations* means the points at which the several parts of an army are detrained. Such germs of misunderstanding should not be permitted to obtain a foothold in professional works. It would be better to drop the designation, "Base of Operations," in so far as it refers to the depôts of supply, and substitute therefor "Line of Magazines," as suggested by the author, on page 212.

But on page 215, we find a new complication in the definition of a "Base of Operations." We are told there that a "Base of Operations" is the frontier zone, upon which the corps of an army concentrate before beginning active operations. There is altogether too little attention paid, in most text-books, to technical designations and distinctions, and history, in consequence, is often hard to read.

We encounter a similar confusion of terms when the author comes to discuss *Fronts*. We find *Strategic Fronts*, *Fronts of Operations*, and *Fronts of March*, described and discussed. It seems all very simple and clear, until we turn a page or two, and then we find a difficulty in telling which is which. Of course, this may be a personal infirmity, but the fact that it exists, in any subject, demands the adoption by text-writers of a clearly characteristic and unmistakable technical nomenclature.

The Front of Operations is, in reality, the Zone of Operations, and there is no good reason why it should not be so named. Then there seems to be no difference between *Strategic Fronts* and *Fronts of March*. Why, then, should the text be complicated by two technical terms for the same thing.

Again, on page 229, we stumble upon *Lines of Operations*, which the author admits are often vaguely defined, and we agree with him, even after reading his own definitions. We should say, *The Line of Advance* of an army is the system of roads which connects it with its objective. *The Line of Operations* is that part of the *Line of Advance* which lies in front of the army, and the *Line of Communications* is that part which lies behind it.

After defining and discussing *Lines of Operations* and *Communications*, and citing many examples from the campaigns of Napoleon and more recent leaders, the author reaches the conclusion that the maxims of the old masters on those subjects are not to be disregarded with safety. And no one will deny it. Yet the combinations of von Moltke in the campaigns of 1866 and 1870, exhibit successful operations on divergent lines and from divergent bases, in direct violation of these very maxims. Can it be that the electric telegraph has upset the maxims? The author avoids the point, but a discussion of the subject would be interesting.

In connection with *Lines of Communications*, the author cites Sherman's march from Chattanooga to Atlanta, and says that its boldness "can, perhaps, be compared only to the skill with which the communications were maintained and protected," page 308 ; and he adds, a little further down the page : "However instructive they may be, the events of the War of Secession can give, so far as modern armies are concerned, but an incomplete idea of the establishment of lines of communication and manner of employing and protecting them." Seeing that we established and maintained longer lines of communications than have ever been attempted in Europe, and

that the nations of Europe have adopted, in their teachings, our methods of military railroad construction and destruction, and are seriously thinking of copying the cavalry raid, the author's statements are refreshing.

Among the preparations for war, discussed, we are not surprised to find *Projets of War* holding a prominent place; but we are sorry. That nations should abuse the friendship, and even the hospitality of their neighbors by playing the spy—in other words, by taking impressions of their keys and bolts, with a view to future burglarious entrance, is not a pleasant thing to talk about; in fact, it must make a lasting peace impossible. It is one of the saddest signs of the times, and justifies a nation in jumping on a neighbor and destroying him, merely as a preventative against similar treatment.

The third, and last chapter treats of operations, offensive and defensive, and we must pass it by with only a few comments, as we have already exceeded the limits usually allowed to a book review. As between the offensive and defensive, the author concludes that the offensive has lost none of the advantages attributed to it by the old masters, although Clausewitz is cited as being in favor of the defensive.

In discussing mobilization and concentration, the special case of the Germans in 1870 is treated in detail, and constitutes an interesting and instructive study.

We find ourselves at the end with regret, for, although we disagree with the author on not a few points, we willingly confess that we have reaped a profitable harvest in perusing the book, and feel sure that every professional soldier who studies it will have the same experience.

JAMES CHESTER, *Capt. 3d Artillery.*

Great Captains.*

In this volume—a course of six lectures—Colonel Dodge has given a most entertaining and instructive description of the character, life, and work of the six great Captains of history.

He places before the reader a clear and yet comprehensive picture of these great men, and tells of their faults and evil works, as well as of their virtues and good deeds.

Colonel Dodge contrasts, most instructively, the characters of the six great Captains, and shows that Cæsar and Frederick performed their best work when 50 years of age, Hannibal and Gustavus Adolphus when in the thirties, Alexander when 25, Napoleon when 39.

Of Alexander we read: "he was easily master of his trade, as perhaps no one else ever was;" "He was a master of logistics;" "His rapidity was unparalleled." He was grand, heroic and magnificent in deeds, as well as beautiful in person. He was never called upon to show his capacity to face disaster, but possessed every remarkable military attribute, and showed no military weakness. He commenced his work at the age of twenty-one, and died at thirty-three. He was, Alexander the Great.

Hannibal is admirably described. Like Alexander, he was from early youth trained to arms, and, like Alexander, he was attractive in person as well as in mind. He was brought up to hate Rome intensely, and the humiliation of that haughty empire was the fixed purpose of his life; and well he performed his tremendous task. Hannibal took command of the army when 24 years of age, and closed his career at 45. He was pure, courageous, enduring: a master of stratagem, and the "Father of Strategy." Hannibal had no vices, and, excepting Gustavus Adolphus, was, perhaps, the most admirable of the great Captains.

* *Great Captains.* By Theodore Ayrault Dodge, Bvt. Lieut.-Colonel, U. S. A. Boston: Ticknor & Co., 1889.

"Cæsar is the only one of the great Captains who trained himself to arms;" the others owed their military training to their fathers, excepting only Napoleon, who received his at the best school in France.

Cæsar was a man of fashion, a dandy; entered politics; at 42 was chosen consul; then began the study of the military art, and in Gaul rapidly became a great General. His campaigns in Gaul are well described. The author says: "There is nothing more noteworthy in all military history than Cæsar's broad conception of the Gallic problem, nor more interesting than his self-education. It is true that a soldier is born, but he has also to be made, and Cæsar made himself more distinctly than the others:" "The greatest, though not the most admirable, man who ever lived."

Of Gustavus Adolphus, the author says: "He was tall, handsome, and strong. His bearing was noble. His quick mind robbed work of effort; his ideas were clear, and he expressed them crisply and in happy words; his voice was rich and his manner convincing. A remarkable memory served to retain the names and merits of numberless worthy men." "He was sober, of simple habit and upright life." "He was more than a monarch—he was a man."

In a tactical sense, Gustavus did much for the Art of War. But what has given him unfading reputation as a Captain, is the "conduct, for the first time in the Christian era, of a campaign in which the intellectual conception overrides the able, consistent, and, at times, brilliant execution. From a mere contest of animal courage, he had raised War, at one step, to what it really should be, a contest in which mind and character rule, and not brute force."

"He showed the world that War could be conducted within the bounds of Christian teachings; that arson, murder, rapine were not necessary concomitants of able or successful War—to him belongs, unqualifiedly, the credit of proving to the modern world that War is an intellectual art; and the still greater credit of humanizing its conduct."

The great Frederick was a keen student of history, "and there is nothing that trains the high grade of intellect, which a good leader must possess, as birthright, as does the study of the deeds of the great captains, for out of these alone can that knowledge be gleaned, or that inspiration be caught, which constitutes the value of the art."

Frederick was raised in adversity, which developed his character, and his obstinacy. He ascended the throne to find at his hand a splendid army ready to do his bidding. He did not love War, but loved Peace, and he loved his country. He was generally successful, but often suffered dire disaster; and in disaster he showed his greatness of character, his fertility of perseverance, his business ability, as well as his military genius.

"In all history there is no such series of tactical feats as Frederick's. "No doubt Napoleon, at his best, was the greater soldier, * * * but Frederick, in trial and disaster, was, unspeakably, greater than Napoleon, both as soldier and man."

"In certain respects, Napoleon was the greatest of all soldiers. He had, to be sure, the history of other great captains to profit by; he had not to invent; he had only to improve. But he did for the Military Art what constitutes the greatest advance in any art; he reduced it to its most simple, most perfect form."

Colonel Dodge compares the great captains briefly, but forcibly and instructively. Napoleon, he likens to a comet. Frederick to a fixed star, less brilliant, but ever constant. Napoleon burned out his lamp, but Frederick never waned. Napoleon succumbed to disaster; Frederick and Hannibal were greater in disaster than in success. Alexander and Gustavus never looked real disaster in the face, nor, indeed, did Cæsar; but Cæsar offered wonderful countenance to threatening calamity. Gustavus is immeasurably above the others in point of character, and is their equal in force and intellect. Perhaps, take them all in all, as soldiers, statesmen, law-givers, Cæsar and

Napoleon are the two greatest men, but they sink below the rest in their motives and aspirations.

"In intellectual grasp, all six great captains stand side by side. In enthusiastic activity, and in all the qualities which compel good fortune, Alexander stands clearly at the head. Caesar was a giant in conception and execution alike. Gustavus will always rank as the most splendid character in nobility of purpose and intelligence of method, which the annals of the world have to show. Frederick is not only the Battle Captain, who never blanched at numbers, but, truly, the last of the kings. Napoleon carries to the highest plane of genius and power and success, and then declines. We begin by feeling that here, indeed, is the greatest of captains, and we end by recognizing that he has not acted out the part. No doubt, taking him in his many-sidedness, Caesar is the greatest character in history. It may not, unfairly, be claimed that Napoleon follows next, especially in that he preserved for Europe many germs of the liberty which was born of the blood of the Revolution. Caesar was the most useful man of antiquity; Napoleon comes near to being the most useful man of modern times. But neither Caesar nor Napoleon appeal to us as do the splendid, open-hearted Alexander; patient, intrepid, ever-constant Hannibal; the Christian hero, Gustavus; and daring, obstinate, royal Frederick."

J. McC.

The Campaign of Königgrätz.*

"Contemporary military history," says Derrécaigaix, furnishes many examples of different modes of concentrating armies. That of the Prussians, in 1866, is one of the most instructive. When it was completed, it seemed quite natural; but if we imagine ourselves placed amidst the circumstances which marked its opening scenes, we are struck by the difficulties to be met."

Coming so soon after our great War, lasting but two short months, and preceding by but a few years the great struggle between France and Germany, this war failed to attract the attention it deserved among the generality of military students. The rapid successes of the Prussians were attributed, in too great measure, to the needle gun and the great problems in strategy there solved were, for the time being, lost sight of. As a study preliminary to that of the campaign of 1870-1, however, it is full of suggestion and significance.

"It was the merit and good fortune of Prussia in 1886," says General Trochu, "as formerly in the time of the great Frederick, that she foresaw the spirit of *evolution* in the ways and means of War, studied their various conditions very attentively in time of Peace, learned them for the most part and applied them opportunely and resolutely,"

"Napoleon," says Hohenlohe, "was our first teacher in real strategy. The youngest pupils of Napoleon, our generals in 1866 and 1870, surpassed the master."

The study of the campaign of Königgrätz, by Lieutenant Wagner, presented in this small volume, indicates careful investigation and honest thought and labor. The language is clear and good, although there is no good reason for speaking of "*Riesengebirge mountains*," since "*Riesengebirge* (Giant Mountains)" would have been a better expression and quite as clear.

The account opens almost at once with the military operations. A brief account of the political situation, and a sketch of the events, and causes that led to the War, would surely have required but little space, and would have added much to the reader's

* *The Campaign of Königgrätz*, by A. L. Wagner, Lieut. 6th U. S. Inf., Leavenworth, Kan., 1888.

appreciation of the general events transpiring in the course of the campaign. The outline of the manner in which military service is rendered in the two armies is an appropriate and useful introduction to the campaign.

The record of the events of the campaign flows along smoothly, keeps the attention fixed, and presents a clear picture of the successive scenes and actions. The subject-matter is well selected, the descriptions are brief and graphic, and the story is told in military language, with but little generalization, and no effort to relieve the mind of the strain of following movements on the map. Since it is a purely military study, and not a popular account, such is, of necessity, its character, especially as the campaign is presented here in a very condensed form.

The author's criticism of the first events and movements is, on the whole, a fair estimate of the character and of the actions of the Austrian leader, and deserves careful consideration, especially as much of it appears to be the result of original reflection.

"Von Benedek's great fault was his failure to decide promptly in regard to the Army, which he should contain while throwing his weight upon the other. Placing an exaggerated value upon his interior position, he does not seem to have considered that every hour of Prussian advance diminished his advantages; and he was, apparently, unable to make his choice of the two plans of operations which presented themselves. * * * If the Austrian Field Marshal had learned the lesson taught at Atlanta, Franklin and Petersburg, he would have made use of intrenchments."

This is perfectly true, as a mere statement of fact, but is it fair to expect Von Benedek, only a year or so after the close of our War, to have thoroughly learned the great lessons there taught? Does not the reference to intrenchments sound rather like praise of our feats in the Civil War, than fair and deserved blame of Von Benedek? Moreover, as a matter of fact, had not Von Benedek learned this lesson, at least in a degree, for do we not find him making use of intrenchments? and, indeed, in quite a high degree, when we remember that the Army had not been previously instructed in making and using intrenchments. Our Army, it is true, was never *instructed* in that matter, but neither did it learn it in a day.

There is other evidence of a feeling of prejudice on the part of the author towards the Germans, apparently on account of some adverse criticisms by them on the character of the armies during our war.

In speaking of the ignorance of the Prussians, of the near presence of the Austrians on the plateau of Dubenetz, he says: "Such a blunder during our Civil War, would, probably, have furnished a text for a Teutonic sermon on the mob-like character of American armies." Alas, at the beginning of our war, and through a considerable part of it, no such blunder, if one may judge from the accounts of De Trobriand and others, even in parts of the famed Army of the Potomac, was necessary to furnish such a text.

The author warms to his task in the great events of the decisive battle, and gives some very fine dashes of color to the picture here and there.

"At 8 o'clock, Von Alvensleben, commanding the advanced guard of the Guard Corps, at Danbrowitz, heard the cannonade in the direction of Benatek. Without waiting for orders, he at once put his command in march for the scene of conflict, notifying his corps commander of his departure, and sending word to Von Fransecky that he would be at Jericek by 11.30. The rest of the Corps quickly followed, marching straight across country, up hill and down hill, pushing through the heavy mud with such restless energy that several of the artillery horses dropped dead from fatigue."

In summing up the battle of Königgrätz, we find another little touch of bitterness:

"A bit of reflection upon these facts might convince certain European critics that the failure of victorious American armies vigorously to pursue their opponents, was due to other causes than inefficient organization, or a lack of military skill."

Now, one can hardly study the campaigns of our great war without being continually struck by the fact, that the victories were not followed up. Passing by the great examples of neglect in this respect, we simply call attention to the opinions of the great captains of the war. General Grant at Shiloh was irritated at General McCook's desire not to send his troops any further in pursuit. General Sherman still believes that McPherson lost the opportunity of his life in not attacking at Resaca. General Sheridan says of Buell's battle of Perryville, that it "remains in history an example of lost opportunities;" at Missionary Ridge, he even practised a little deception to induce General Granger to follow up the last attack; and throughout his memoirs we find similar references to failure to follow up victories; while in his own campaigns, what is most striking after his energy in attacking, is his energy in pursuit. Indeed, it was not until Grant, Sherman and Sheridan rose to the higher commands, that pursuit after victory became the rule.

The criticisms of Von Benedek seem a little uncharitable:

"Not the least of the causes of the Austrian defeat was the autocratic policy of Von Benedek, which caused the entire management of the Army to be centralized in his own person, and the plan of battle to be locked up in his own mind."

This, though true, was the general system in vogue, in both armies at this time, and not the special attribute of Von Benedek. Hohenlohe continually refers to the fact, that this was also the method on the Prussian side, and explains the great advantage of having several armies (as in 1870) instead of a single army, thus avoiding this very trouble. The Prussian method of first stating the general object of a movement in an order, was, however, a great improvement on Von Benedek's older method.

The author's arguments against the use of the bayonet, lose much of their force in face of the fact that no European nation has as yet abandoned it. The bayonet produces other effects more potent than mere wounds. In that stage that arises in every battle, according to Grant and Sheridan, when either side is just ready to give way, the bayonet will usually decide.

The general account of the campaign, as well as the main mass of comments, are well worthy of careful study by military students, and the little book will find its place mainly as an example of a campaign studied in the light of our own war.

JOHN P. WISSER,

First Lieut., 1st Arty.

Minor Tactics and Strategy.*

This work, undoubtedly, meets a long-felt want. The art of application has never been considered a part of the tactical training of United States troops, regular or volunteer. This fact became painfully apparent during the early years of the Rebellion. Our best-drilled battalions, accustomed to manoeuvre only on the drill-ground, were unable to execute the simplest movements on the battle-field with celerity and precision. Officers and men were alike at fault, and more time was wasted in reconnoitering the ground, than should have been required to execute the movement.

Strange as it may seem, no steps were taken to remedy this evil until very recent years. In fact, so far as we know, the author of this work is the first to propose a practical remedy. There are many reasons for this seeming indifference. Scattered

* *Practical Instruction in Minor Tactics and Strategy*, by Lieut. John P. Wisser, 1st Artillery, U. S. Army. D. Appleton & Co., New York.

as our little army has always been, and, until recent years, actively employed in hunting, fighting, and watching Indians, building barracks, and making roads, the most zealous commander could never spare the time to indulge in such exercises. Then, our Infantry Drill-Book, erroneously called "Infantry Tactics," contains an order from the Secretary of War, absolutely prohibiting "all infantry exercises and manoeuvres not embraced in that system." So a battalion commander, required to form "front into line" on such a field as the Wilderness, would be obliged to disobey orders, or report that the prescribed manoeuvre could not be done. But it is to be hoped that the fetters of the drill-book will be relaxed, and that the training proposed by our author shall have free course and a fair trial in every arm of the Service.

As a matter of course, a reviewer is always on the look-out for defects, and he rarely fails to find them. In this case, we stumble upon one immediately. The absence of an index or even a table of contents, is an inexcusable omission in any work that pretends to be a text-book. Then, we are disposed to find fault with such an expression as *Drill Tactics*, which meets our eye on page 5. *Drill* is sufficiently expressive and exact, without having *Tactics* tied to it; and to call a drill-book "Tactics," is a military heresy which ought to be got rid of among professional soldiers.

Since we have our captious cap on, we may as well enter our objections to the author's definition of *Minor Tactics*. We object to having *Grand Tactics* crowded out in such an unceremonious way. He says *Minor Tactics* include "the movements on the battle-field and its immediate vicinity." If that be so, surely they are something more than the "A. B. C. of the Art of War," which, on the same page, he tells us they are. Nothing confuses and exasperates a student more than carelessness in the use of technical terms, and inexactness in definitions.

Again, on page 6, we read that "strategy has become, in a measure, a *political* act," and we are unwilling to admit it. Were the masterly movements by which the German armies, in 1870, broke up a few fragments of the French Army, and thereby isolated its larger parts, and dealt with them separately, in a measure *political* acts? I doubt very much if Marshal von Moltke thought them so; and I also doubt the propriety of abolishing, even by implication, the grandest chapter in the Art of War.

We had hoped to be able to be amiable by this time, but here, towards the bottom of page 6, we find mention made of "The elementary tactics of the three arms." Now, what does that mean? We have had *Minor Tactics* defined as the A B C of the Art, which leaves a narrow margin at that end of the subject for elementary tactics. But the author, no doubt, means *Drill*; and how much better it would have been to say so?

On page 7 we find a rather curious sentence. The author says, "The study of *military history* is usually carried to excess, while the *practice* is either totally neglected, or greatly undervalued." Now, we think we know what the author means, but, being captious, we must ask, What is the practice of military history? The practice of history of any kind is, surely, a new business.

The proposed "System of Practical Instruction" is ably sketched in pages 8-12, and calls for no comment. The language is clear and exact, and the arrangement excellent. But, towards the bottom of page 12, we plunge headlong into the abstruse subject of, "The Relations of the Three Arms." This has all the effect of a *douche* upon us. We had hoped to work up to this grand finale through the tactical employment of a company, and a battalion of infantry, a squadron of cavalry, and a battery of artillery; but, here we are, in the maelstrom of mixed tactics, without warning given. The subject, however, is treated in a very lucid manner, the kernels of the nuts, of which there are a great many in the basket, being contained in the problems proposed for solution. Of course, the problems must be carefully studied to be prop-

erly understood. We do not pretend to be able to pronounce upon their merits by merely reading them over, but we *can* say that they are clearly stated, and the solutions, explanations, and comments are interesting and instructive, and seem to cover the ground reasonably well.

The book is handsomely gotten up, and well printed, and the maps excellent. We have no hesitation in saying that the author has rendered a valuable service to his professional brethren, regular and volunteer, and that his work deserves to be studied and practised as a recognized part of military training.

J. C.

The English Restoration.*

This is the first that we have seen of the Scribner reprints, of a series of volumes, twenty-eight in all, which treat of the great epoch of history, ancient and modern. The old way of writing *Universal Histories*, is happily giving place to a far more interesting and instructive method, by which the attention of the reader is directed to comparatively short periods of time, and to the great events, whose consequences are far-reaching and enduring. A method which is better calculated to produce a decided and lasting impression upon the student.

The topics of this volume, the consolidation of the French Monarchy, the Invasion of the United Provinces, and the great struggle for constitutional government in England, during the reign of the second Charles, though, of necessity, briefly treated, are very clearly presented, and the interest is sustained to the close of the volume. The contrast between the various periods of the French, that sham, Revolution, and the parliamentary contest in England is well brought out; and the characters of the chief actors delineated with skill and fairness. Notably, is this the case with Louis, himself. It is not uncommon to attribute the successes of the earlier part of his reign to the able men in his service. But back of them, moulding, consolidating, directing them, was the great ability, and no less remarkable energy and industry of Louis himself. His announcement, on the day after the death of his great minister, Mazarin, that he intended to take the government upon himself, was laughed at by his mother, the regent during his minority, and his courtiers as a passing whim. But the whim lasted for more than fifty years. During all that time, no man in his kingdom worked harder than he. "The best means," he says himself, "I thought, of doing something of importance, was to surprise my enemies, by my diligence. * * * I therefore, got everything ready much sonner than was customary. I collected everywhere corn, meal, fodder, powder, bullets, guns, and everything, the lack of which might have delayed the march of my army. But, particularly, I kept carefully exercising the troops immediately about my person, in order that, from my example the other leaders might learn to take the same care of those of whom they had the command." Words that deserve the attention of military men, in fact, of all upon whom responsibility rests, and that, followed by Napoleon III., would, in all probability, have prevented the destruction of his Empire at Sedan.

H.

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OUR EXCHANGES.

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